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Mechanical and Physical Science,

CIVIL ENGINEERING, THE ARTS AND MANUFACTURES,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

DECEMBER, 1836.

Practical and Theoretical Mechanics and Chemistry.

Report of the Committee of the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, on the Explosions of Steam Boilers. PART II., *containing the* GENERAL REPORT *of the Committee.*

(CONTINUED FROM p. 306.)

71.—III. *Explosions may arise from defects in the construction of a boiler, or its appendages.*

This comprehensive division includes the discussion of the form, material and mode of manufacture of the boiler and of its appendages. The Committee have, however, no desire to interfere with the present or future state of the engine in these respects, further than as their duty requires them to give candidly to the public, their opinion of facts which are on record.

72. 1st.—*Form.* The influence of the form of a boiler in producing danger is of course very great; but to consider the numerous varieties of form would be impossible, even if their minute differences were known to the Committee. Every boiler should be required to stand frequent proofs as a test of its sufficient strength, but the working properties of each, with originally adequate strength, may be very different.

73. It may, in general, be remarked, that the old wagon-boiler of Watt, should be only used when very low steam is employed. The varieties of

the cylinder boiler, with or without interior flues, are in most common use in the steamboat-engines of this country. Of these, experience, both abroad and at home, has shown those without flues to be the more safe, and those with them the more economical. The heads of these boilers are, in this country, plane surfaces; in England, frequently, hemispherical, and in France, are required by law, to be of the latter named figure. There is no reason, however, to doubt the sufficiency of strength of the thick plane wrought-iron heads. Of the flues used, those in the smaller cylinders, which pass directly through both heads of the boiler are the more safe;* the flues passing through the convex surface, called L flues, and those which in the larger boilers return without passing through both heads, add nothing to the strength of the cylinders. Observation has shown that boilers with interior furnaces, or flues, commonly give way by the yielding of the flues, or by blowing off the heads. The tubular boilers of Woolf, have, but in one case, as far as the knowledge of the Committee extends,† been used in this country. Other forms of tubular boilers, in which very small tubes contain the water to be vaporized, have, in no case, to their knowledge, on full rial been found successful. The case is very different when, as in the locomotive boilers, the tubes are used as flues: and for obvious reasons. Such boilers have, however, only lately been applied to steamboats.

There does not seem to the Committee, evidence to show that any of these forms are essentially dangerous, though, as before remarked, there are grades among them as to impunity from careless management. From this remark, however, in some degree, should be excepted the L flue-boiler, which is incident always to a source of danger, hereafter to be pointed out. The remarks apply to single, or detached boilers.

74. Connected boilers, on board of steamboats, are incident to a source of danger which has already been pointed out, (art. 59, &c.) and after examining the remedies which have been proposed to meet these circumstances, the Committee are of opinion that they are of so varied a kind that the use of these boilers cannot be continued without certain danger, and therefore ought to be laid aside. Those at present in use could easily be detached, so as to connect only two boilers at most, and have a separate supply-pump for each pair.

75. In a former division of the subject, (II.) the Committee showed the great danger which is produced in a boiler by highly heated metal; any boiler, therefore, which has parts exposed to heat, without being in contact with water, is essentially defective. The L flue boiler is of this kind, though as it is only used in small cylinders, the exposure is not considerable.‡ The boiler with a steam-chimney presents an extension of this exposure, the boiler being continued up vertically at one end, so as to inclose the flue.§

* Experience seems to warrant this conclusion, and it does not appear probable that the difference of temperature between the flue and outer shell, even in boilers with interior furnaces, can be sufficient to injure a wrought-iron head, by the excess of the expansion of the flue. The case is different when cast-iron is used for a boiler-head.

† At Richmond, Virginia. See Burr on Explosions. Journ. Frank. Inst. vol. vi. p. 334.

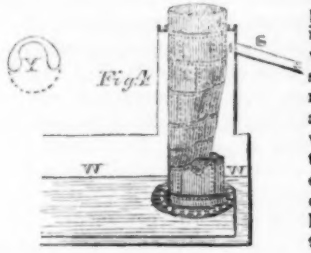
‡ A curious case of the overheating of a flue by the accumulation, and subsequent taking fire, of soot, is described by Mr. Hebert, in No. XI. of the Replies to the Circular of Committee on Explosions.

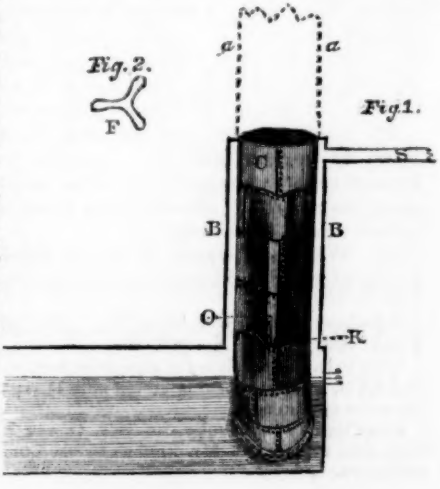
§ It should be recorded to the credit of the liberal minded patentee of this boiler, that he has afforded every opportunity to investigate its defects, and appears no sooner to have been convinced of the danger to particular parts of it, than he has applied his skill to produce a remedy.

The idea is to economise the heat found in this flue, by heating the steam which is around it, and thus producing a small surcharge of heat which prevents condensation in the steam-pipe and cylinder. But the flues which the chimneys inclose, are thus exposed to become unduly heated. Two explosions which have occurred in boilers with steam-chimneys* have torn the same portion of the flue, and were so similar, as to show that they are to be attributed to an inherent defect in this construction. Indeed the presence of metal through which a highly heated draught is passing, while it is in contact only with steam, which cannot carry off the heat rapidly, is sufficient to warrant a decision against such a form of boiler, even if facts had not spoken so loudly in regard to it.

76. The Committee feel constrained to recommend to constructors to discontinue the making of connected boilers, of those with L flues, and with the extension constituting a steam chimney.

* In justice to the force of this concluson, the Committee feel it necessary to give extracts from the excellent accounts of the explosions on board of the Ohio and of the William Gibbons steamboats, by Thos. Ewbank, Esq., of New York. The first of these explosions occurred on the Hudson, in 1832, and the second in New York harbour in 1836. The annexed figures represent in plan and section the ruptured flue of the Ohio. WW, in the elevation, is the water line, C the flue around which the steam chimney is placed, and S, the steam-pipe leading from the steam-chimney. The rent took place from fifteen to twenty inches above the water line. This part of the flue is always exposed to the heated air from the horizontal flues which unite in the flue E, and is never covered by water. The line of fracture does not deviate more than six inches from a horizontal line. It is partly along a line of rivets, but chiefly through the centre of the sheets. In portions of one sheet, the metal is reduced from its original thickness of one-quarter of an inch, to one-eighth, and even to one-sixteenth of an inch. Jour. Frank. Inst,; vol. x. p. 226, No. XXIX. Replies to Circular, &c. The William Gibbons has one boiler of wrought iron, and similar in construction to those of "The Ohio" and "New England," but having a greater number of horizontal flues. The flue BB, within the steam-chimney, was collapsed so as to form a three cusped figure, as shown in fig 2. The rent R, thus produced, was four inches above the roof of the boiler. It was in one of the horizontal seams, and confined almost wholly to it, extending nearly three feet, or about one-third of the circumference of the flue. The flue was iron, one-fourth of an inch in thickness, and its thickness was not sensibly diminished previous to rupture. Jour. Frank. Inst. vol. xvii. p. 298. The fuel used ordinarily, was a mixture of anthracite coal and wood, but, on this occasion, it appears that the fire had been urged with quantities of wood.





77. It would be improper to leave this part of our subject, without calling attention to another point in the construction of boilers, which is to be avoided. It is the formation of small spaces intended to contain water and surrounded by fire.* All experience has shown that steam cannot be generated in small tubes without driving out the water, and these arrangements are equivalent to tubes; and besides being liable to the accumulation of deposites, they are exposed to have the water carried from them unless when under considerable pressure. The weakness of boilers of these irregular forms should never be lost sight of.

78. *2nd.—Material and manufacture.* As early as 1818 a Committee of the British House of Commons, on the authority of practical and scientific men whom they examined, recommended the disuse of cast-iron as a material for steam-boilers. This material has now so generally been abandoned, for this purpose, that remarks upon its defects are not necessary. Even the cast-iron heads for boilers which were used a few years since on the Mississippi are, the Committee believe, now giving place to wrought-iron ones. The materials in common use for steam boilers are wrought-iron and copper.

79. The Committee have made, by the arrangement stated in the preface to the first part of their report, an extensive series of experiments on the strength of the different varieties of wrought-iron and copper, manufactured for steam boilers in the United States. These experiments they hoped to have presented before making this report, but circumstances not now necessary to be made public, have prevented them from doing so, and they deem it inexpedient longer to delay on this account. They must refer, therefore, to a report, specially upon this subject, for a complete development of their views, as well as for information in regard to the proper thicknesses for steam-boilers, working under different pressures. They ought, however, to remark here, that the views usually entertained of the importance of working iron, have been entirely confirmed by them. The ultimate strength of a bar, or sheet of iron coinciding more nearly with the strength which the whole bar exerts to prevent a first fracture, or the bar or sheet being rendered more uniformly strong, and therefore better adapted for use in the construction of steam-boilers, the more it is worked. Iron which has been heated nearly to redness has its tenacity permanently injured, being affected, though in a less degree than copper, the weakness of which in such a case has long been well established.†

80. There can be no doubt that the strength of boilers may be diminished by constant and often unequal pressure, by which the material is injured so far as to give way under a less strain, than that which it may once have borne.‡ By ordinary wear, from oxidation, &c. their strength is necessarily much impaired.

81. When salt water, or spring water highly charged with saline matter, is used to feed boilers, iron is very rapidly acted on, and extreme care

* Ewbank on the explosion of the boilers of the steamboat New England. Jour. Frank. Inst., vol. xiii. pp. 292, 293.

† On both these points see also the remarks of Mr. Lester in Replies to Circular, &c. No. XVII. where the fact is stated both in regard to iron and copper, as resulting from his owne xperience.

‡ See Replies to Circular, &c. Nos. II. and XII. Col. S. H. Long and T. Bakewell, Esq; also evidence of Mr. Bramah before Com. of House of Commons, 1817, Dodd's collection.

should be used in frequently cleansing them.* Careful owners would resort to more frequent proof by the forcing pump than in other cases. This would serve to detect corrosion in particular spots, to which the material is so liable. Copper boilers not being similarly acted on, are more safe in such situations, but there seems no reason to suppose that iron may not be safely used, with due precaution.

82. Instances of dangerous defects in construction, or arising from use, in boilers are but too well attested. The awful explosion on board the steamboat Helen McGregor,† by which more than thirty persons lost their lives, took effect by forcing off the cast-iron head of a wrought-iron boiler, throwing the boiler in the opposite direction: the head was known to be cracked, before the explosion occurred. It is not clearly made out whether this result was produced by a gradual increase of pressure,‡ or by the return to its level of the boat; which had been careened by stopping at a landing place. The steam was not let into the cylinder to propel the engine, when the explosion happened. The boiler was one of six connected boilers of three feet diameter. A cast-iron head should never be united to a wrought-iron boiler with flues,§ since, independently of the defects to which the metal is liable, the inequality of expansion is very likely to crack it.‖

83. A defect in a wrought-iron boiler head, was detected, by one of our correspondents, which we are surprised that any boiler maker should have allowed to pass. In turning the flanches by which the head is riveted to the cylinder, the iron was turned so sharply, as to crack it more than halfway through. This was one of four boiler heads belonging to the same set, found by Mr. E. W. Benton to be unsound. They could not have stood proving.¶

There can be no doubt but that the repairs to the boiler of the Caledonia were improperly made,** an iron plate having been fastened upon the boiler with copper rivets: this seems, at least in part, to have been the cause of the accident which subsequently occurred.

84. The idea seems formerly†† to have been entertained that dangerous explosions could not occur in wrought-iron boilers, which were merely rent without doing injury. It is almost needless to remark that the whole tenor of the evidence before the Committee contradicts the idea. Wrought-iron may even be separated into fragments, but the great source of danger is in the escape of the hot water, which, with the steam generated by it, produces death in one of its most painful forms.

85. Steam-boilers should not only be proved when originally made, but

* An instructive description of the action of salt water on iron will be found in the evidence of Professor Faraday before the Com. H. Commons of Eng. on steam navigation, 1822.

† Nos. III., IV. and XXI. of Replies, &c.

‡ Replies to Circular, No. IV.

§ See also explosion of Atlas, Replies, &c. No. VIII., and No. XXI., Car of Commerce, No. XXI.

‖ Evidence of John Taylor, Esq. before Com. of House of Commons. A cast-iron boiler head affixed in his shops to a wrought-iron boiler and originally proved with a pressure of 100 lbs. cracked by heat when only exposed to a pressure of steam of 20 lbs.

¶ No. VIII. Replies, &c. Boilers of Tally-ho Steamboat.

** Replies, &c. Nos, V., VI., VII., VIII., XXI.

†† Evidence before Com. of House of Commons. Dodd's Collection.

from time to time, to guard against their gradual wear, or accidental injury; and especially after every important repair made to them. In the intervals care must be secured by other means. These proofs have been recommended by most of our valued correspondents.

86. In the attachment of sheets of metal to each other to form boilers, and in the fixing of heads to boilers, constructors appear to have lost sight of the fact that the metal which is taken out for the rivet holes weakens the sheet, and that materially. In examining cases of explosion from direct pressure, and where no undue heating or special weakness has led to the result, the lines of rivets appear to determine the direction of the first fracture.* A very neat example of this was given in the bursting of an iron cylinder in the experiments of the Committee.† The head of the cylinder was forced off, carrying with it the metal which projected beyond the line of rivets. The rivet-holes had cut out rather more than half of the circumference of the metal forming the convex surface, along the circle passing through the centres of the rivet-holes, and thus had made the strength of the convex surface to resist rupture in a direction perpendicular to the axis of the cylinder, less than its strength to resist a rupture in the direction of the axis.‡

87. The exposure of joints, formed by the junction of boiler plates, to the fire, may be mentioned as liable to produce very rapid wear. The heat is not conducted off as rapidly as by the other parts of the boiler, and the lower sheet is exposed to rapid oxidation.

88. 3*rd.*—*Appendages to the boiler.* Of these the principal ones have already been made the subject of remark, and recommendation by the Committee. The forcing pump, as one of the most important, deserves further notice in this place. It is not the intention to recommend any particular form of this pump, especially as the Committee believe that most commonly in use to be entirely adequate to all its objects. They may remark, however, that they consider several valves between the supply reservoir and the pump, and also between the pump and boiler, as of the greatest importance. They would further recommend to be placed on the eduction pipe a cock similar to that used in locomotive engines. A rod and handle connected with this should be placed in a convenient position, for the engine-man to ascertain, by turning the cock, if the pump is in action. Although this apparatus cannot dispense with due attention to the means of ascertaining the level of the water within a boiler, it may give notice of a defective supply, in time to apply a preventive, instead of a remedy.

89. The Committee consider that their remarks already made in relation to the mode of applying heat to a boiler have been sufficient. They do not see that the use of a fusible metal or fluid bath can be applicable, in practice, to the heating of a steam boiler, or would, if applicable, realize the advantages which have been claimed for them.

The recommendations embodied in the present division of the subject will be found carried out by the suggestion of appropriate enactments in the project of a law which is appended to this Report.

* Ewbank on the Explosion of the Boilers of the New England Steamboat. Jour. Frank. Inst., vol. xiii. p. 293.

† Report of Committee on Explosions. Part 1, p. 67. Jour. Frank. Inst. vol. xvii. p. 224.

‡ With an equal thickness of metal the strength in the former case would have been double that in the latter.

90. IV. *Carelessness, or ignorance, of those intrusted with the management of the steam-engine.*

It might be supposed that the fact once known that the engineer or fireman, who, from carelessness, or other cause, allows a boiler under his charge to explode, is in almost every case the first victim of the disaster, would produce care in those intrusted with the engine. But experience shows that this is not so; and the Committee, in proposing remedies, do but the duty which has been confided to them, and proved indispensable by examples, not to be mistaken or disregarded.

91. Familiarity with any sort of danger is so sure to produce callousness to it, and due caution is so apt to be considered as timidity, that a tendency to carelessness must be considered as the natural consequence of the situation of an engineer, or fireman. The subject of the causes of explosions in steam-boilers has been so little investigated, that men well versed in general science might be excused for ignorance of it, and steam-engineers should not therefore be too harshly or hastily blamed for what is incident to the nature of the subject, rather than the fault of the profession. The fact of carelessness or ignorance has however been so much insisted upon by our correspondents* that it must be assumed, and endeavours made to apply a remedy.

92. In the present state of general education in our country it would obviously be impracticable to insist that firemen, or even steam-engineers, should be versed in the scientific principles, which regulate the use of steam. The public have, however, a right to expect from employers, that their agents, who are intrusted with human life, should have a thorough practical acquaintance with the steam-engine, and to demand that those who have information of the sources of danger, should lay down plain rules for the guidance of those who have been referred to. As a guard against carelessness, the public have further a right to expect from the higher authorities, beginning with the chief engineers, and rising to the captains of steamboats and masters of shops, that they should exert all the moral influence which vigilance can produce. And from the law, that it should constrain all these, by appropriate penalties, to the discharge of their responsible duties.

This view the Committee have carried out in the project of a law which accompanies their report.

93. V. *Cases of collapse from a partial vacuum within a boiler, or its flues.*

These cases are so little applicable in the state of the steam engine in this country, that the Committee have postponed their discussion until the last.

It is certain that the boiler of a high pressure engine of proper strength for ordinary purposes, would also be able to sustain the action resulting from even the sudden formation of a vacuum within it. Low pressure boilers have been crushed by the pressure of the atmosphere when a vacuum has been formed within.† These accidents are effectually guarded against, as far as experience has shown, by a valve opening inwards with which Watt's boilers were provided.

94. A case of explosion at the Mold Mines, in Flintshire, which has

* Replies to Circular, &c. Nos. III., VIII., IX., XVII., XIX., XX., XXI., XXIII., XXVIII. Also, Remarks by "an Engineer," Philos. Mag. vol. i. &c. &c.

† Arago on Explosions. Annuaire du Bureau des Long. 1830, pp. 148, 169 and 170, also Journ. Frank. Inst., vol. v. pp. 404 and 412.

been circumstantially detailed by John Taylor, Esq.,* seems to prove that a rarefaction produced in the interior flues of a high pressure engine, may determine an explosion of the most violent description. The boiler which exploded, belonged to a set of three, feeding the same engine. The fuel used was bituminous coal. The furnace doors of all three of the boilers had been opened and the dampers of two had been closed, when a gust of flame was seen to issue from the mouth of the furnace of these latter, and was immediately followed by an explosion. The interior flue of this boiler was flattened from the sides, the flue and shell of the boiler remaining in their places, and the safety valve upon the latter not being injured. Mr. Taylor states it as probable, that the steam pressure at the time of this accident did not exceed thirty pounds, and that the water was at its proper height. He assigns as the probable cause which determined the collapse of the flue, the ignition of a mixture of gas from the coal with atmospheric air, the contents of the furnace not being carried up the chimney on account of the closing of the damper, by which a partial vacuum was produced. If the strength of the flue was but little more than sufficient to resist a steam pressure of thirty pounds, it is plain that the cause assigned is adequate to have produced the effect. It must be admitted, however, that the testimony of the fireman who escaped injury by the explosion, and who would have been subjected to all the blame of the accident, if any attached, his comrades having been killed, is of that kind which induces a doubt, whether the steam pressure and height of water, were exactly as stated.

The accident, however, suggests the precaution as necessary with coal, and with some kinds of wood, not to close a damper soon after fresh fuel has been added; if the furnace is within the boiler, the injurious effects may be very serious, even more so than in the cases already referred to, where the furnace is not so placed.

95. That a vacuum can occur within a steam-boiler which is in action, as has been propounded within a few years past, is a supposition too palpably contradicted by the facts of the case to require any examination here.

96. VI. Having closed the subject of the means of preventing explosions in steam boilers, the committee have yet to consider *whether it is possible to provide protection against their effects when they occur.*

The very respectable scientific and practical men who have at different times drawn the attention of the public to this matter, give undoubted authority to the suggestion. The means proposed are, by carrying the passengers in a separate boat from the engine, or by placing the boilers on the guards of the boat, and separating them from the parts occupied by the passengers, by a suitable bulwark.

97. In regard to the first of these plans, it has been attempted, and for want of sufficient patronage by the public, has been laid aside. Public opinion seems to set strongly towards precautions which shall render the engine safe, without crippling its power of giving speed.

98. The larger steamboats on our Atlantic waters have generally the boilers upon the guards,† but without any obstruction between them and

* On the accidents incident to steam boilers. Philos. Mag. vol. I. see also remarks upon the same by "a practical engineer," and by W. J. Henwood, in the same volume.

† We are pleased to see that a boat in which the boilers are placed upon the guards has been put in operation upon the Mississippi. This we trust is only the first of many of this kind to be hereafter constructed.

the inner parts of the boat. This affords but a partial security, diminishing probably the extent, but not preventing, the destruction of human life. That a bulwark of sufficient strength to protect against explosion, without adding too much to the weight of the boat, can be devised, the Committee are not prepared to assert positively, though they believe that it could.

99. Their views incline entirely to the protection of the hands, as well as passengers by rendering the boiler safe, and they fully believe that this may be done without incumbering the boats now in use, or requiring, in a majority of cases, an entire change of structure in the engine.

They have, however, to meet opinions which they hold in so much respect, introduced a clause in the proposed bill, annexed to this report, by which a bounty is, in fact, offered upon a boat constructed with suitable bulwarks between the interior part and the boiler.

100. The Committee having now completed their examination of the causes of explosion, with their preventives, as far as they are informed upon the subject, and made all the recommendations, which this examination has suggested to them, refer to the accompanying project of a law for the regulations of the boilers and engines of steam-vessels, for the means of carrying the more important of these suggestions into effect.

The provisions of this law refer only to the means of preventing the explosions of boilers of steamboats, or of affording protection against their effects. With the regulations in regard to the navigation or police of the boats, however important, this Committee do not feel warranted in interfering. They believe that the experience necessary to frame such regulations will be found in the appropriate Committees of Congress, upon whose attention they would respectfully urge the annexed provisions relating to the engine.

That such an enactment will contribute to the safety of the public, without interfering injuriously with those interested in the navigation by steam or in the manufacture of the steam-engine, is the deliberate opinion of this Committee.

Respectfully submitted,
In behalf and by direction of the Committee, by
ALEX. DALLAS BACHE,
Chairman of the Com. on Explosions, &c.

Presented to the Board of Managers of the Franklin Institute of Pennsylvania for the Promotion of the Mechanic Arts, and approved, September 21st, 1836.

M. W. BALDWIN,
Chairman of the Board of Managers.

WILLIAM HAMILTON, Actuary.

A BILL

*For the regulation of the Boilers and Engines of vessels propelled in the whole or in part by steam.**

TABLE OF CONTENTS.

SECT. 1. Requires an enrolment, and license of navigation.
2. Provides a penalty for navigating without a license.
3. Requires the appointment of an inspector of boilers and machinery, and defines his duties, &c.

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* The sections of this bill which are taken from that reported by the Committee on Naval Affairs, in the Senate of the United States, at the session of 1835-6, are marked by a note of reference to the sections of the latter.

4. Requires a certificate to the inspector from the owner or master of a steamboat, of the pressure of the steam intended to be used.
5. Makes provisions intended to secure the safety of boilers.
   ART. 1. Requires two safety-valves.
   2. Provides for the graduation of the first.
   3. Fixes the maximum pressure to be allowed upon it.
   4. Provides for the regulation of the second.
   5. Requires the second to be inclosed so as not to be accessible except by the captain of the boat.
   6. Puts the second under the control of the captain of the boat.
   7. Regulates the least rise to be given to the lock-up valve.
   8. Directs the form of the lever of the valve.
   9. Provides for each two small cylinder boilers, one set of safety-valves.
   10. Requires a mercurial-gauge for low-pressure boilers, and prescribes its arrangement.
   11. Provides that it shall be open to examination by passengers.
   12. Requires a fusible metal apparatus to be attached to every boiler.
   13. Directs the fusible metal to be inclosed.
   14. Provides for its not being tampered with.
   15. Inspector to compound the fusible metal.
   16. Prescribes the composition of the fusible metal.
6. Requires an examination into the fulfilment of the foregoing provisions, by the inspector, previous to giving certificates.
7. Penalties for interfering in any way with any part of the apparatus provided for the safety of the boiler.
8. Prohibits more than two contiguous boilers to be connected by a water-pipe.
9. Penalties for the bursting of a boiler caused by a deposite.
10. Prohibits boilers in which the metal is exposed to heat without being in contact with water.
11. A thorough examination of the boilers, &c. required of the inspector. Proofs directed and proof-pressure prescribed. Certificates to be given by the inspector to be posted up under penalties prescribed. Fees of inspector.
12. Proofs, &c. to be made every six months. Circumstances under which a license may be forfeited.
13. Requires the pumps for supplying the boilers with water to be kept at work, when a boat is stopped for a temporary purpose. Penalty prescribed.
14. Qualifications for the office of inspector laid down.
15. Penalties for explosions when the master or engineer is engaged in gambling, or is intoxicated. Also from racing, &c.
16. A neglect to obtain or renew certificates as prescribed, to bar from the recovery of a claim for freight or insurance. Owners of boats to be in such cases responsible for loss, or damage, by explosions.
17. Penalties in case of explosion when the captain, &c., has neglected to have the required inspections made and certificates issued.
18. Provides a bounty for boats with boilers on the guards, and suitable bulwarks between them and the interior of the boat.
19. Inspector to be dismissed in case of making false certificates, &c.
20. Provides for the recovery of fines, &c. Proviso, that suits must be instituted within two years after the offence has occurred.

SECTION 1.*—*Be it enacted by the Senate and the House of Representatives of the United States of America, in Congress assembled*, That it shall be the duty of all owners of steamboats, or vessels propelled in the whole, or in part by steam, on or before the —— day of ——, one thousand eight hundred and ——; to make a new enrolment of the same under the existing laws of the United States, and to take out from the collector or surveyor of the port, as the case may be, where such steamboat or vessel is enrolled, a

* Sect. 1 of the bill reported in Senate U. S.

new license, under such conditions as are now imposed by law, and as shall be imposed by this act.

Sec. 2.*—*And be it further enacted*, That it shall not be lawful for the owner, master, or captain, of any steamboat, or vessel propelled in the whole, or in part, by steam, to transport any goods, wares, and merchandise, or passengers, in, or upon the bays, lakes, rivers, or other navigable waters of the United States, from and after the said —— day of ——, one thousand eight hundred and ——, without having first obtained from the proper officer, a license under the existing laws, and without having complied with the conditions imposed by this act; and for each and every violation of this section, the owner or owners of said steamboat, or vessel, shall forfeit and pay to the United States the sum of ——.

Sec. 3.†—*And be it further enacted*, That it shall be the duty of the President to appoint at such ports on the navigable waters, bays, lakes, and rivers, of the United States, as in his judgment will be most convenient to the owners and masters of steamboats, and vessels propelled in the whole or in part by steam, one or more persons who shall be practical mechanics, of competent skill, to make inspections of the boilers and machinery employed in such boats and vessels, whose duty it shall be to make such inspections, when called upon for that purpose, to give to the owner or master of such boat or vessel, duplicate certificates of all such inspections, and the said person, so appointed, shall, before entering upon the duties of said appointment, take an oath, before some competent authority, faithfully to discharge and perform the same.

Sec. 4.—*And be it further enacted*, That the owner, master, or captain of each and every boat or vessel propelled in the whole or in part by steam, shall certify, to said inspector, the greatest pressure, or total elastic force, of the steam intended to be produced in the boiler, which certificate shall regulate in the proofs, trials, and construction, hereinafter required.

Sec 5.—*And be it further enacted*, That each and every boiler of a steamboat, or vessel propelled in the whole or in part by steam, shall be constructed, and arranged, so as to comply with the following provisions:

1. There shall be two safety-valves, each of which shall be competent to discharge the steam made in the ordinary working of the boiler.

2. The first of said valves shall be graduated by the maker of the engine, and have stamped upon the lever, by which it is weighted, the pressure at which it will by calculation open, when the appropriate movable weight is placed at the several marks. Said pressure to be the difference between the pressure of the steam within, and atmospheric pressure on said valve.

3. When the movable weight exerts its greatest pressure, the total pressure upon said valve shall not exceed the pressure as certified according to the provision of the fourth section of this act.

4. The second of said valves, denominated the lock-up valve, shall be immovably weighted, the total pressure upon it not to exceed said certified pressure.

5. Said lock-up valve, with its lever and other attachments, shall be inclosed in a grated box, or otherwise duly arranged so that it can be raised, but not pressed down, except as above provided, upon its seat.

6. Said inclosure, or arrangements, shall be secured with a lock, of which

* Sect. 2 of bill, &c.

† From sect. 3 of the bill reported, &c

the captain or master of said boat shall alone have the key.

7. Said inclosure or arrangements, shall admit a rise in the valve of at least one-fourth of the diameter of its seat.

8. The lever of said valve shall be so constructed as on the rising of the valve, to diminish the effect of the acting weight, by at least one-tenth of the ordinary pressure derived from said weight.

9. When two boilers, each of not more than forty inches diameter, are connected by a steam-pipe, each pair of said boilers may be furnished with safety-valves, as described in this section, for a single boiler.

10. When the certified pressure provided in section fourth, does not exceed two atmospheres, each and every boiler shall be furnished with a mercurial-gauge, indicating by a float or rod, upon a duly graduated and marked scale, the excess of pressure within the boiler over atmospheric pressure, in inches of mercury.

11. Said gauge and scale shall be so placed as to be readily examined by any and every passenger on board of said boat.

12. Each and every boiler shall be provided with a fusible metal apparatus of suitable form and dimensions, to be applied to the boiler itself, or to its flues, at the place which may be considered that of greatest heat, or most liable to exposure from a deficient supply of water.

13. Said fusible metal shall be contained in a tube to prevent its exposure to pressure, and shall on softening, communicate an alarm by some suitable device.

14. Said apparatus shall be duly secured from being rendered ineffective, in the manner of the lock-up safety-valve heretofore provided.

15. The fusible metal hereinbefore referred to, shall be compounded by the inspector, who shall place it in the apparatus as aforesaid, and shall satisfy himself that the whole is duly arranged as heretofore prescribed; for which service he shall receive, on certifying the same, a compensation of ——.

16. The said alloys shall be compounded according to the certified pressure of steam within the boiler, by the following table of parts, by weight, of the ingredients.

TABLE OF ALLOYS FOR USE IN CLOSED TUBES, AND WITH A METALLIC STEM.

Certified pressure in atmospheres.	Tin.	Lead.	Bismuth.	Certified pressure in atmospheres.	Tin.	Lead.	Bismuth.	Certified pressure in atmospheres.	Tin.	Lead.	Certified pressure in atmospheres.	Tin.	Lead.
1½	8	8	7.5	4	8	8	3.4	8	8	8.0	12	8	12.3
2	8	8	6.2	5	8	8	2.2	9	8	9.8	13	8	13.2
2½	8	8	5.3	6	8	8	1.2	10	8	10.6			
3	8	8	4.6	7	8	8	0.5	11	8	11.4			

Sec. 6.—*And be it further enacted*, That before delivering the certificate hereinafter to be provided for, the inspector, heretofore provided, shall examine the apparatus required by section fifth, and shall ascertain that all the provisions of that article are complied with.

Sec. 7.—*And be it further enacted*, That any person or persons whatsoever who shall wilfully overload or otherwise render inoperative said safe-

ty-valve or valves, or render ineffective said mercurial-gauge or gauges, by plugging up or stopping off, or in any other manner preventing their action, or shall in any manner, impair, or interfere, with the usefulness of said fusible metal apparatus, shall for every offence be subject to the penalty of —— dollars, and to an imprisonment at the discretion of the court, not to exceed ——, and in case of accident to said steam-boiler, resulting from said offence, by which life is lost, shall be deemed to have been guilty of manslaughter, and punished according to law for said offence.

Sec. 8.—*And be it further enacted*, That not more than two boilers of a boat, or vessel, propelled in the whole or in part by steam, and those immediately contiguous, shall have connected water pipes, nor shall the license heretofore provided for, be issued until the inspector has satisfied himself, and has certified, that the provision of this section is complied with.

Sec. 9.—*And be it further enacted*, That for each and every bursting of the boiler of a steamboat or vessel propelled in the whole, or in part, by steam, which shall occur from a deposite of sedimentary matter within a boiler, the master of said vessel, shall forfeit the sum of ——— dollars; and that in case life shall be lost by the same, he shall de deemed to have been guilty of manslaughter, and shall be liable to prosecution accordingly.

Sec. 10.—*And be it further enacted*, That no boat or vessel propelled in the whole or in part by steam, shall be licensed until the inspector has certified on examination, that no part of the boiler of said boat is, ordinarily, directly exposed to flame, or to heated air from the draught, without the immediate contact of water.

Sec. 11.*—*And be it further enacted*, That it shall be the duty of the person who shall be called upon to inspect the boilers and machinery of any steamboat or vessel, in conformity to the provisions of this act, carefully, fully, and thoroughly, to inspect and examine the engine and machinery of said boat or vessel, and to state his opinion of their soundness: and he shall, moreover, provide himself with a suitable hydraulic pump, and, after examining into the state and condition of the boiler, or boilers, of said boat, or vessel, it shall be his duty to test the strength and soundness of said boiler, or boilers, by applying to the same a hydraulic pressure equal to three times the certified pressure which the boilers are to carry in steam; and if he shall be of opinion, after such examination and est, that the said machinery and boilers are sound and fit for use, he shall deliver to the owner or master of said vessel or boat, duplicate certificates to that effect, stating therein the age of said boilers, and the pressure of steam which may be carried by them, and which shall in no case exceed one-third part of the proof-pressure, one of which certificates it shall be the duty of said master or owner, to deliver to the collector or surveyor of the port, whenever he shall apply for license or for renewal of license: the other he shall, under a penalty of —— hundred dollars for every day that he shall neglect so to do while the boat is running, cause to be posted up and kept in some conspicuous part of the boat or vessel, for the information of the public; and for each and every inspection of the said machinery, and inspection and test of the said boiler or boilers, the said inspector shall be allowed and paid by the owner or master thereof, and before the delivery of said certificates, the sum of —— dollars.

Sec. 12.†—*And be it further enacted*, That it shall be the duty of the

* Sec. 5 of the bill reported in the Senate of U. S. with slight verbal changes.

† From Sec. 6 of the law reported in the Senate of U. S., the period for making the inspections of the boilers, &c., is here proposed to be extended to six months.

the captain or master of said boat shall alone have the key.

7. Said inclosure or arrangements, shall admit a rise in the valve of at least one-fourth of the diameter of its seat.

8. The lever of said valve shall be so constructed as on the rising of the valve, to diminish the effect of the acting weight, by at least one-tenth of the ordinary pressure derived from said weight.

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10. When the certified pressure provided in section fourth, does not exceed two atmospheres, each and every boiler shall be furnished with a mercurial-gauge, indicating by a float or rod, upon a duly graduated and marked scale, the excess of pressure within the boiler over atmospheric pressure, in inches of mercury.

11. Said gauge and scale shall be so placed as to be readily examined by any and every passenger on board of said boat.

12. Each and every boiler shall be provided with a fusible metal apparatus of suitable form and dimensions, to be applied to the boiler itself, or to its flues, at the place which may be considered that of greatest heat, or most liable to exposure from a deficient supply of water.

13. Said fusible metal shall be contained in a tube to prevent its exposure to pressure, and shall on softening, communicate an alarm by some suitable device.

14. Said apparatus shall be duly secured from being rendered ineffective, in the manner of the lock-up safety-valve heretofore provided.

15. The fusible metal hereinbefore referred to, shall be compounded by the inspector, who shall place it in the apparatus as aforesaid, and shall satisfy himself that the whole is duly arranged as heretofore prescribed; for which service he shall receive, on certifying the same, a compensation of ——.

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1½	8	8	7.5	4	8	8	3.4	8	8	8.0	12	8	12.3
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Sec. 8.—*And be it further enacted*, That not more than two boilers of a boat, or vessel, propelled in the whole or in part by steam, and those immediately contiguous, shall have connected water pipes, nor shall the license heretofore provided for, be issued until the inspector has satisfied himself, and has certified, that the provision of this section is complied with.

Sec. 9.—*And be it further enacted*, That for each and every bursting of the boiler of a steamboat or vessel propelled in the whole, or in part, by steam, which shall occur from a deposite of sedimentary matter within a boiler, the master of said vessel, shall forfeit the sum of ——— dollars; and that in case life shall be lost by the same, he shall de deemed to have been guilty of manslaughter, and shall be liable to prosecution accordingly.

Sec. 10.—*And be it further enacted*, That no boat or vessel propelled in the whole or in part by steam, shall be licensed until the inspector has certified on examination, that no part of the boiler of said boat is, ordinarily, directly exposed to flame, or to heated air from the draught, without the immediate contact of water.

Sec. 11.*—*And be it further enacted*, That it shall be the duty of the person who shall be called upon to inspect the boilers and machinery of any steamboat or vessel, in conformity to the provisions of this act, carefully, fully, and thoroughly, to inspect and examine the engine and machinery of said boat or vessel, and to state his opinion of their soundness: and he shall, moreover, provide himself with a suitable hydraulic pump, and, after examining into the state and condition of the boiler, or boilers, of said boat, or vessel, it shall be his duty to test the strength and soundness of said boiler, or boilers, by applying to the same a hydraulic pressure equal to three times the certified pressure which the boilers are to carry in steam; and if he shall be of opinion, after such examination and est, that the said machinery and boilers are sound and fit for use, he shall deliver to the owner or master of said vessel or boat, duplicate certificates to that effect, stating therein the age of said boilers, and the pressure of steam which may be carried by them, and which shall in no case exceed one-third part of the proof-pressure, one of which certificates it shall be the duty of said master or owner, to deliver to the collector or surveyor of the port, whenever he shall apply for license or for renewal of license: the other he shall, under a penalty of —— hundred dollars for every day that he shall neglect so to do while the boat is running, cause to be posted up and kept in some conspicuous part of the boat or vessel, for the information of the public; and for each and every inspection of the said machinery, and inspection and test of the said boiler or boilers, the said inspector shall be allowed and paid by the owner or master thereof, and before the delivery of said certificates, the sum of —— dollars.

Sec. 12.†—*And be it further enacted*, That it shall be the duty of the

* Sec. 5 of the bill reported in the Senate of U. S. with slight verbal changes.

† From Sec. 6 of the law reported in the Senate of U. S., the period for making the inspections of the boilers, &c., is here proposed to be extended to six months.

owners or masters of said boats or vessels, to cause the examination of the machinery, and the examination and test of the boilers, as provided in the sections of this act, to be made, at least, once in every six months; and to deliver to the collector or surveyor of the port where such boat or vessel, has been enrolled or licensed, the certificate of such inspection; and on failure thereof, he or they, shall forfeit the license granted to such boat or vessel, and be subject to the same penalty as though he had run the said boat or vessel, without having obtained such license.

Sec. 13.*—*And be it further enacted*, That whenever the master of any boat, or vessel, or the person, or persons, charged with the navigating said boat or vessel which is propelled in the whole or in part by steam, shall stop the motion, or headway, of said boat, or vessel; or the said boat or vessel, shall be stopped for the purpose of discharging, or taking in cargo, fuel, or passengers; he, or they, shall keep the engine of said boat, or vessel, in motion sufficient to work the pump, and give the necessary supply of water, under the penalty of —— dollars for each and every offence in neglecting or violating the requirements of this section.

Sec. 14.†—*And be it further enacted*, That no other than a practical mechanic who shall be of the age of twenty-one years, or upwards, shall have served two years in a steam engine factory, or general machine making establishment, and who shall have a thorough knowledge of the working of an engine, and shall produce satisfactory testimonials of steady habits, shall be employed as an engineer on board of any boat or vessel propelled in whole or in part by steam, provided that for every violation of this section, the owners or master of said boat or vessel shall forfeit the sum of —— dollars.

Sec. 15.‡—*And be it further enacted*, That for every explosion which shall happen from any cause whilst the captain, master, or engineer shall be engaged in gambling, or attending to any game of chance, or hazard, or shall be intoxicated, or which shall happen from racing, or from carrying higher steam than the quantity authorized by the certificate, the owner of such steamboat, or vessel, shall be subject to the penalties provided for in the sixteenth section of this act; and the captain, master, or engineer shall be respectively subject to the penalties hereafter provided in the seventeenth section of this act.

Sec. 16.§—*And be it further enacted*, That any owner or master, of any steamboat, or vessel propelled in the whole or in part by steam, who shall fail to obtain, or neglect to renew, the certificates of examination hereinbefore provided for in the several sections of this act, shall be barred from the recovery of any claim for freight or insurance that may accrue when without said certificate, and should any loss or damage to property, or injury to persons, in such case occur in consequence of the breaking of any part of the machinery, or bursting of the boiler or boilers, the owner shall be responsible to the full amount of said loss, damage, or injury.

Sec. 17.‖—*And be it further enacted*, That the captain or master of any boat or vessel propelled in the whole or in part by steam, which may not

* From Sec. 7 of the bill reported in the Senate, &c.

† The Committee propose this section as a substitute for the 16th section of the bill reported in the Senate. That section requiring an examination of engineers by the inspectors.

‡ From Sec. 13th of the bill reported, &c.

§ From Sec. 11th of the bill, &c.

‖ From Sec. 12 of the bill, &c.

have been examined, and obtained the certificates required by the several sections of this act, shall in the event of loss or damage to property, or injury to persons, occasioned by the breaking of any part of the machinery, or the bursting of the boiler, or boilers, be subject to a fine of not less than ——— nor more than ——— dollars, and an imprisonment of not less than ———, nor more than ———; and that in event of loss of life being the result of such accident, then said captain, or master, shall be adjudged guilty of manslaughter.

Sec. 18.—*And be it further enacted*, That any boat or vessel propelled in the whole or in part by steam, which shall have its boilers upon the guards of the boat, and shall have between them, and the interior of the boat, or vessel, a sufficient bulwark of timber, or other suitable material, so that passengers shall be protected effectually from injury in the event of explosion, shall be, on a certificate to the foregoing effect from the inspector heretofore provided, exempted from the payment of fees for the taking out of the license of navigation, and shall have remitted one half of the fees for proving and for other purposes of precaution heretofore provided. The fees remitted in such case to be assumed and paid to the respective officers by the United States.

Sec. 19.*—*And be it further enacted*, That for any false certificate, or one given without the thorough examination contemplated by this act, the inspector herein provided shall be dismissed from office, and fined not lessthan ——— dollars, nor more than ——— dollars, and imprisoned not less than ———, nor more than ———; and shall be incapable of ever being reappointed to said office.

Sec. 20.†—*And be it further enacted*, That all penalties, fines and forfeitures imposed by this act, may be sued for and recovered in any court of the United States of competent jurisdiction within the district, or circuit, where the same may have been incurred, in the name of the United States—one half for the use of the informer, and the other half to the use and benefit of the United States.

Provided, That all suits, actions, or indictments instituted, commenced, or found, under this act, shall be commenced or found, within two years after the offence has been committed, or the cause of action accrued.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a machine for Milling Coin, invented and introduced into the Mint of the United States. By Franklin Peale.

For the purpose of reducing manual labour, and expediting the processes of the Mint, I was induced, during the latter part of the last year, to make designs for the construction of a Milling machine, to be propelled by the steam power ordinarily employed in the Mint, a model of which I had the honour to exhibit at one of the late conversation meetings of the Institute. From these designs and model, the machines to which this communication relates, have been most satisfactorily executed in the workshops of the Mint, and are now in full operation in the coining department.

* Sec. 17th of bill reported, &c.

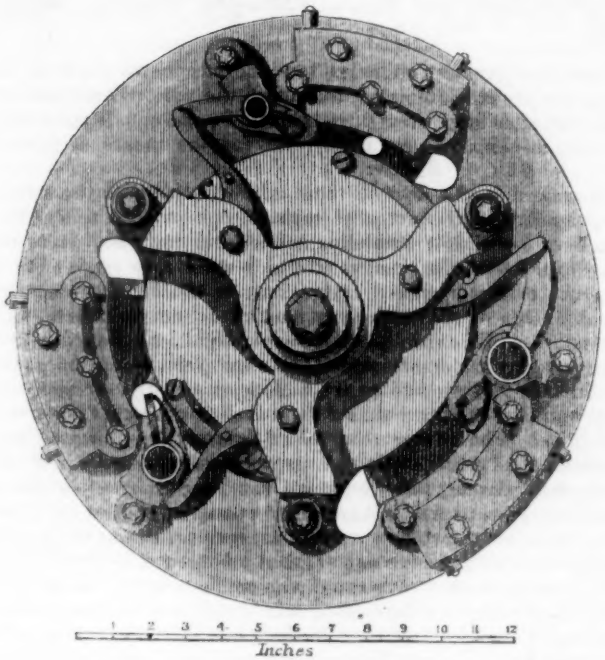
† Sec. 18th of bill, &c., with the addition of the proviso at the close of the section.

To those who are unacquainted with Mint operations, it will be well to explain, that the operation of milling has for its object, to throw up a thickened edge upon the *blanks* or *planchets*, previous to their being struck, by which means a better border can be given to the coin, with less labour or injury to the dies, it is also, sometimes employed to impress letters or ornaments upon the edge of the coins.

ELEVATION.

A classical tripod, of cast-iron, supports the table on which are placed the feeding tubes and dies; through the centre of the stand a vertical shaft rises from the room beneath, on the lower end of which is a pulley and its band, furnished with a clutch box, by means of which, movement is given, or arrested, as occasion requires. A winch handle may be applied to the hexagonal top of the axis, for the purpose of adjustment, or to propel the machine, if required, by manual force.

HORIZONTAL VIEW.



Upon the central axis is a wheel, furnished with two steel dies upon it periphery, the length of each of which corresponds to the circumference of the coin to be milled; and on the trilateral spaces of the table, are firmly screwed blocks for the outside dies, furnished with the necessary adjusting screws, by means of which the proper degree of pressure is given. Upon the axis immediately above the central wheel, an oval *cam*, or *eccentric*, is placed, for the movement of the feeders; this cam is set in *time* to place the blanks between the dies, when the extremities of the latter are opposite to each other. The feeders are *levers*, moving on centres, placed on each of the three arms of the gallows which supports the upper ends of the axis; which *levers* are kept against the cam by spiral springs, contained within a cavity at the centre of motion. A circular blade, or *pitcher*, as it is technically called, takes the lowest blank from the pile contained in the feeding tubes, and pushes it forward, at the required moment, and a light curved spring prevents its being thrown in advance of the movement. Nearly all of the parts are exhibited in the annexed views.

This machine is triplicate, and all its feeders may be put in motion at the same time, or any one of them, as occasion may require. Each division is capable of milling 200 pieces, or more, per minute, equal to 12,000 per hour, with the attendance of a boy only; and during this rapid operation, separates any defective pieces that may pass into the tubes. This machine has been in operation since February of the present year, and has given unqualified satisfaction in every respect.

Observations on Microscopic Chemistry. By Jno. W. Draper, M. D. *Professor of Chemistry and Natural Philosophy, Hampden Sidney College, Va.*

1. One of the greatest obstacles to a more general study of scientific chemistry, is a prevailing opinion, that of all the various branches of knowledge, this demands more diversified resources, and entails upon those who prosecute it, an expenditure, usually beyond the means of private individuals.

2. It therefore is the duty of those who wish well to the science they cultivate, to point out the error of such an opinion. Within a few years there has been a complete revolution in chemical manipulation, or the mode of making experiments; a change, to which we are to ascribe the present rapid advance of the science. Operations on the large scale, are never performed, except by those who are public teachers, and here the necessity of rendering effect visible at a distance, calls for a degree of magnitude in experimenting, that unfortunately leads the pupil to conclude, that such pursuits can only be followed by the possessors of large fortunes, and even that they would meet with "almost impossibilities," except they were residents of cities. Those large retorts, and bells, and complicated stop-cocks, and furnaces, the innumerable company of vials, and tests, and electrical machines, and galvanic batteries, could not be purchased in the country. This is a conclusion to which those who have a predilection for these studies are often led,—an unfortunate conclusion, for it restrains many a one who would otherwise be an active and efficient labourer in the field. Now, there are few chemists, even among those who reside in cities, and have the disposal of well appointed laboratories, who could not communicate a large stock of highly useful information to their less fortunate brethren. A man, who for a number of years, has been engaged in all kinds of operations of repetition and research, must of necessity be acquainted with a number of simple succedanea, both in the shape of operations and instruments, which at times have obtruded themselves upon his necessities. With this view, I propose to offer my mite, in the hope that it may stimulate others, who are far better able to extend this kind of information.

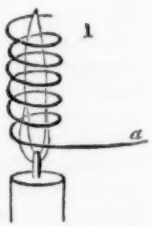
3. The specific properties of any kind of matter, are as well seen in a small particle as they are in a large mass. A piece of marble, not bigger than a pin's head, will furnish the same chemical results, as a piece of an ounce weight. Hence, if the operator possessed that delicacy, and tact which would enable him to work as well with the small quantity as with the large, his result would be equally striking, and equally true. Like all other sciences, in its infancy chemistry had a degree of roughness, which offers a remarkable contrast with the neatness and finish of modern manipulation; instead of those enormous alembics, and colossal retorts, which dignify the works of the earlier writers, we now give instructions to perform the same distillations in fragments of quill tubes; the blow-pipe has replaced the hundreds of blast, and forge, and reverberating furnaces, over which the alchemist toiled, by the sweat of his brow, not, alas, gaining his bread; and the grain weight and cubic inch have become the units of the laboratory, instead of the pound and the gallon.

4. The manipulation of microscopic chemistry, consists in the art of working with small portions of matter. It requires a degree of manual dexterity which practice alone can give, but which if once gained, is of vast importance to the chemist. It reduces, to an indefinite extent, the charges

and expenses he incurs in a series of experiments; and, what is equally valuable, there is a great saving of time. A few minutes will often put him in possession of the same facts, that on the old plan he must have been hours or days in acquiring. Again, there are often circumstances under which he would be compelled to work on minute quantities, as perhaps in the detection of a poison in the stomach, or in the analysis of a precious substance, and here if his previous habits had not accustomed him to operations on the small scale, he would soon find himself quite incompetent to perform his task. In this point of view, perhaps future chemists will hereafter assign a much higher rank to Dr. Wollaston than to Sir H. Davy, the simple, refined and delicate experimenting of the former, affording a more useful guide than the dashing brilliancy of the latter.

5. It is not many years, since the mouth blow-pipe was transferred from the workshop of the jeweller, to the laboratory; it has already become one of our most powerful and useful implements, giving a command over a range of temperature nearly as high as the melting point of wrought iron. Still later the simple candle or lamp has been employed, without any means of urging the flame, and when properly managed, its applications are also very extensive; to the chemical student, it is an invaluable substitute for all kinds of extensive furnaces, and therefore deserves to be thoroughly understood. As there are many parts of the United States, where oil is with difficulty obtained, and lamps scarcely ever used, I propose first to make a few remarks on the power and method of using a tallow candle, as a source of heat.

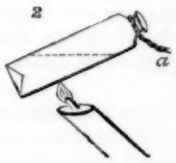
6. The range of temperature that can be commanded by a tallow candle, is by no means inconsiderable; it is well known that iron or steel filings sprinkled on the flame, are made at once white hot. And if a copper wire be presented to it, under certain circumstances, it will be fused in a few moments. This is a simple experiment, but one well deserving of repetition; so far however as I am aware, it has never yet been pointed out; it is striking, and perhaps in the hands of a skilful machinist, might have some useful applications. A thin copper wire, is to be bent into a spiral of six or eight turns, over a cylinder of wood, about the size of a black lead pencil; one end is left uncoiled as at *a*, to be used as a handle; the spiral is now to be put over the flame of a candle, whose wick has been fresh snuffed; it is to be arranged so as entirely to surround the flame, and held by the extremity *a*; the flame immediately, burns very dimly, and puts on a greenish hue, and the copper wire melts and falls down. So complete and perfect is the abstraction of the heat from the flame, that I doubt not that if a narrow tube were placed under similar circumstances, and a stream of water forced with great velocity through it, it would be an advantageous mode, if not the most advantageous, of applying flame as a source of heating liquids.



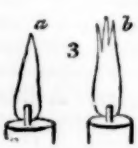
7. A great variety of experiments are required, respecting the fusibility of minerals or other substances, and the characters they display in the fire; these for the most part, may be made by paying due attention to the size of the fragment operated on, viz. that it shall be sufficiently small, and that the support on which it is presented to the flame, be as fine as possible, and of a highly non-conducting material. It is the perfect fulfilment of these conditions, that enables a simple candle flame to burn iron filings. A little

cone made of white clay, and having a very fine point, is excellent in these respects, and is useful also in blow-pipe experiments.

8. There are certain minutiæ to be attended to, in working with a candle, that should here be noticed. They arise from the candle burning with a flickering flame, from the wick becoming too long and smutty, and requiring continual snuffing. This last inconvenience, may, however, be avoided by a simple expedient. Suppose it was required to dissolve a certain quantity of any saline substance in boiling water, and that to effect the solution, would require the application of heat for several minutes. Having beaten the salt into small fragments, put it into a common vial, of such a size, that the amount of liquid shall not half fill it. Around the neck of the phial, double a strip of paper, the projecting ends of which are to be twisted into a handle, *a*. Now, if the candle be held in a vertical position, it will be found, that it would require continual snuffing at inconvenient moments; but, by inclining it at an angle to the horizon, as soon as the wick exceeds a certain length it projects beyond the edge of the flame, and is burnt off, by the continual access of atmospheric oxygen, and the candle never requires snuffing. In the operation before us, it will be found unsafe to apply the flame to the extremity of the phial, because nearly all phials are very thick in the bottom, and fracture would certainly ensue; but, by applying the heat an inch higher up, all kinds of solutions, distillations, &c., may be safely, cheaply, and expeditiously performed by this means. In the course of a few minutes, the liquid commences boiling, and the solution gradually proceeds; steam is copiously evolved from the mouth of the bottle, and the whole vessel attains a temperature which renders it inconvenient to touch; the advantages of the twisted paper handle are now apparent, since the vessel may be held in the hand, the elbow resting on the table, while steam is copiously rushing out of it, and all the phenomena of the solution distinctly seen.



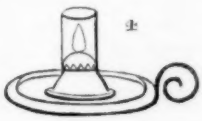
9. In this, as well as all similar operations with candles, and also with lamps, there is an important observation to be attended to—it refers to the distance between the bottom of the vessel, and the top of the flame. It might be supposed that a maximum of temperature would be reached by plunging the vessel into the flame; such, however, is not the case; a copious deposit of carbonaceous matter at once covers the surface, and the high radiating power of this coating, exerts a powerful cooling effect. Nor is that all; every thing like cleanliness is entirely sacrificed; if the fingers happen to touch it, they become soiled, and it is impossible to see the action going on in the materials employed. All these inconveniences are avoided by placing the vessel half an inch, or if the flame flickers much, a whole inch above its apex; the cleanliness of the vessel is insured, there is an abundant supply of heat, and the operator can distinctly see any kind of reaction going on in the materials. It may be observed that these remarks do not apply to the spirit lamp.



10. When a candle thus arranged, is burning as it ought to do, its apex is not a cone, as *a*, but is as represented at *b*, ending in a kind of three pronged fork; the point of maximum available temperature, being about half an inch from the tips of the prongs. In an appropriate, but very simple arrangement of phials, such as will be shortly pointed out, evaporation and distillation to a certain extent, may thus

be carried on over a candle; the distillation of water, or the making of strong nitric acid, are thus readily accomplished. Except, however, when the vessels are exceedingly small, it will not be possible to distil sulphuric acid, or mercury, too high a temperature being demanded.

11. Where oil is readily procured, the common oil lamp is a much more convenient implement than the candle, affording a more steady and constant flame, which can easily be protected from the agitation of currents of air, by a piece of sheet tin, two inches wide and three long, bent into a cylindrical form. This chimney ought to have its lower edge serrated, to admit a copious afflux of air, and at the same time to stand firm on the lamp. Sheet tin, or copper, or brass, can be readily cut by a common pair of scissors, and that elasticity which sometimes hinders a piece from retaining the shape into which it may be bent, is overcome, by making it red-hot in the fire.



12. I have somewhere seen a description of a small portable furnace which is used by the Cingalese jewellers, and found it very eligible in experiments which demand the ignition of a larger mass than can be worked either with the simple candle, or blow-pipe. It consists of a shallow earthen tray; of the size and figure of a saucer, which is to be filled with saw-dust, or finely chopped straw. On the surface of this non-conducting bed, a little charcoal fire is raised, one of the pieces of coal having been previously ignited. The fire is urged by blowing *at* it, through a piece of hollow reed, or tobacco pipe stem, or even through a straw; there is a certain distance, at which the pipe has to be held, to produce the most powerful effect, this is easily determined at the very first trial, by a peculiar roaring sound that the blast makes among the embers; this distance varies from 2 to 6 inches, depending on the degree of ignition, and the force with which the wind is urged. Gold, silver, and copper, may be melted in this furnace, when the fire is about as large as one's fist, and the igniting and crucible operations required in mineral analysis, may be conveniently performed in it.

13. The bowl of an earthenware tobacco pipe, makes a suitable crucible for this furnace, the hole in the bottom of it being stopped by a pellet of clay. Persons, however, who reside where refractory clay can be procured, will find it convenient to accustom themselves to the manufacture of small vessels, such as crucibles, tubes, retorts, &c. And as knowledge of this kind gives a degree of independence to a chemist, affording him facilities for working without a long and vexatious delay in having to send to the cities for suitable implements, it is well for him to make himself master of it; the process for forming a crucible is as follows. A piece of wood, six or eight inches long, and of a suitable thickness, has one of its ends cut into a shape suitable for the inside of the vessel, it is finished off neatly with a file, and no projecting part, or asperities, left; it should be considerably longer than the height of the intended crucible. The clay is to be prepared, by picking out from it any little pebbles, grit, or any other impurity, and bring it by kneading with a due quantity of water, to the condition of a stiff homogeneous paste. A small cylinder of it, is then to be rolled out on a board, until it is about one-sixth or one-eighth of an inch thick, observing not to roll it out entirely on one side, but after having

passed the roller, (which may be a piece of stick rounded, or a common ruler,) two or three times on one side of it, to shave it up, by passing a knife between it and the board, and then turning it over, to roll it on the opposite side; by this means it is prevented from sticking to the board. The core *a*, fig. 6 having been slightly greased with lard, is then covered with a sheet of the clay, as high as *a*, the seam where the two edges meet is neatly united by pressure with the fingers, and also the bottom closed. Care must be had, that not too much clay be put on the core, or the work will be bungling and clumsy, it will therefore be evident, that the size of the sheet laid on, should be properly adjusted. The core can be removed without any injury, by clasping the crucible all round with one hand, and twisting at the wooden handle with the other. As the clay slips off, the pressure must be relaxed, for fear it should be crushed. A degree of polish may then be given, to the inside and outside, by rubbing them gently with a wet finger, and the upper edge neatly rounded off: and if necessary, a beak made as at *b*. No difficulty will be met with in thus making crucibles up to an inch high, and half, or three-quarters in diameter. A few lids for them, shaped as at *c*, should also be prepared.

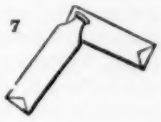
14. In like manner, tubes may be moulded on a cylindrical stick, but when they are over a certain length, difficulties arise in slipping them off, a part of the clay moves, but the rest adhering, disfiguration ensues. For long tubes, and also for retorts, it is therefore better to form a core of bees-wax, by moulding it in shape between the fingers, the clay is then to be applied, and when dry, the wax is to be melted out. Those who are adepts at this kind of work, will have no difficulty, however, in moulding a retort on a piece of wood, cutting it into symmetrical halves, with a pen-knife, taking it off the core, and applying the cut edges again together; it is to be remarked, that the core must in no instance be anointed with too much grease; it will hinder cut edges joining, if it should get upon the junction.

15. Vessels thus made are very porous, and therefore unfit for many uses. They may be glazed, by covering them with a paint, made of a mixture of lime, borax and water, applied with a common brush. The greatest difficulty, however, in manufacturing them, consists in drying them thoroughly, without cracking; the desiccation must be very gradual, and equal; first, dry them in the sun, and then approach them slowly to a fire; some clays are more prone to crack than others, and the addition of fine sand to them is a great advantage; but the process of drying, must still be carried on cautiously. When once, however, they have been made red-hot, all further danger on this account is over; at a temperature slightly higher, the lime paint daubed on melts into a glass, which soaks into every pore and renders all quite tight.

16. To show the extensive application these homely little vessels have, I may remark, that I have seen one of them, a retort, whose belly was not larger than a school-boy's marble, and neck three inches long, when properly glazed, and charged with the carbonaceous matter that results on igniting cream of tartar in close vessels, filled with the green vapours of potassium, when placed in the furnace of sec. 12; a proof of its tightness and applicability.

17. Very useful glass vessels, for distillations, sublimations, &c. may be made out of apothecaries' phials. One of these will serve for a retort; and

another, with its neck cut off, for a receiver: the object of cutting the neck off, being to give entrance to the mouth of the other phial. The readiest way for a beginner to cut glass for these purposes, is by a hot wire laid on the place where it is desired to cut the vessel; in a short time the glass cracks, and the seam will follow the hot wire in any direction; should it refuse, however, to do so, it is because the wire has become too cold. Some kinds of glass are rather tardy in cracking, they may, notwithstanding, be forced by putting a drop of cold water on them, when they have become hot from the touch of the wire; but this expedient has the disadvantage of often starring the vessel.



18. In the books, there are descriptions given, of different methods of igniting gaseous mixtures in close vessels, one of the most usual is by an electric spark; this spark may be procured from the machine, or by an electrophorus made of glass or rosin. There is a substance which, it appears to me, might be very serviceable for the construction of both these instruments. Common, strong, brown paper, is one of the very best electrics we possess, as the following experiments may prove. Take a piece of this substance, ten inches long and four broad, and holding it in the left hand by one end, lay it upon the right knee, placing the right forearm with a gentle pressure upon it. Draw it from between the knee and arm, replace it, and repeat the operation. Then, on approaching a knuckle to it, a spark an inch or two long will be projected from it, with a very audible crack. Or, if it be placed on the side of the wall, it will adhere there. Or, if when thus excited, it be brought over small paper figures on the table, they will dance beneath it. To the success of these experiments, two precautions are required; the paper must be dried before the fire, until it smokes, and the garments must be made of woollen cloth.

19. For attaining high temperature in the interior of jars and glass globes, there is no simple and effectual contrivance; this is yet a desideratum. The solar convex lens is excellent in its way, but it is too dependent on the weather for its action, and too expensive for common use: the igniting effect of a voltaic arrangement, is only to be taken advantage of by those who have powerful instruments at their disposal. Wherever the impression of a powerful heat, under ordinary circumstances is required to be observed, the blow-pipe is of very advantageous use. This instrument, in its simplest form, consists of a straight pipe terminating in a narrow, but neatly rounded aperture *a*. It may be made of almost any material; as of a reed, or a couple of quills slipped on one another; its essential part being the small beak, or termination, which ought to be formed of some infusible metal. On an emergency, the young chemist may make a very useful and excellent instrument, by taking two quills, as *c* and *d*, and slipping the one a short way into the other, and forming the beak, or termination of the extremity, of one of those patent silver pencil cases, which are now in such general use. This may be fitted air tight to the quills, by wrapping paper round it, and is much superior in its action, to many of the brass blow-pipes sold in the shops. These blow-pipes are generally bent, and those who are in the habit of using them consider that as an advantage; but in mineralogical

investigations, there are several advantages in the instrument being straight, the flame is thrown from the operator's face, and he has a better view of the action going on in the materials with which he is experimenting. When glass tubes are to be had, a temporary but very excellent blow-pipe may be made, by drawing out one end of a piece, four or six inches long, to a point, and cutting it off, until the reduced aperture is of a proper size; it requires however, care to be taken, that the fine extremity be not held in the flame, except when the current of air is passing through it, or the temperature suddenly rises, the glass fuses, and the pipe becomes sealed.

20. Occasionally, experiments have to be made when a more exalted temperature has to be applied to a glass vessel, than can be conveniently attained by means of a candle or lamp. If, for instance, it were required to boil an ounce or two of the common brown sulphuric acid of commerce, so as to render it colourless, the operator would not find it convenient to make use of any of the arrangements hitherto described, for there is always more or less risk, in exposing a glass or phial to the naked fire; a risk, too, which it is not desirable to incur, when so highly corrosive a substance as hot sulphuric acid is concerned. The danger of fracture, and its consequences may, however, be avoided, by means of a bath of sand. In all well regulated laboratories, this forms a standing part of the fixtures, though as far as I have observed, it is less used, and its convenience seems to be less understood in this country than in Europe. A very good extemporaneous one, suitable for the purpose here described, may be formed out of a common frying pan, filled with coarse sand, that is free from dust.

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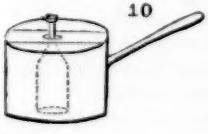
An apothecaries' phial, the bottom of which is thin, may have the sulphuric acid poured into it; it is then to be placed in the sand, so as to be half an inch from the bottom of the pan, and the sand piled round it, not, however so high as to be above the level of the fluid, for fracture will then be liable to occur; thus arranged, the pan may be placed on a clear fire, and the operation satisfactorily performed. Several liquids, as sulphuric acid and alcohol, boil with a kind of explosion, and not in the quiet tranquil manner that water does. A few shivers of glass, or pieces of platina foil, prevent this irregularity. By means of a sand bath, all temperatures may be commanded, from low redness, downwards.

21. Water baths, and steam baths, are also occasionally very serviceable, and very easily constructed, by means of utensils employed in domestic economy; a common tin saucepan, is a convenient vessel for this purpose. It should be filled with water to a suitable height, and the phials containing the material to be exposed, fixed in it so as not to be overturned by any violence in the ebullition; this may be effected by passing their necks through a piece of wood, long enough to fit tightly into the sauce pan.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Franklin Institute.

Quarterly Meeting.

The fifty-first quarterly meeting of the Institute was held at their Hall, on Thursday evening, October 20th, 1836.

Thomas Fletcher, Vice President, presiding.

Charles B. Trego, Rec. Secretary, pro tem.

The minutes of the last quarterly meeting were read and approved.

Donations of Books were presented by Matthew Carey, Esq., R. C. Taylor, Esq., George Fox, Esq., Hon. James Harper, Isaac Hays, M. D., Robt. Hare, M. D., Prof. Alex. D. Bache, Messrs. Carey & Hart, D. Moulson, John Abbott, of Philadelphia; Timothy Claxton, Esq., of Boston, Mass.; Prof. B. F. Joslin, of Albany, New York; Prof. John R. Cotting, of Taunton, Mass.; the Society instituted in London for the encouragement of Arts, Manufactures and Commerce; Francis Baily, Esq. and Petty Vaughan, Esq. of London.

Donations to the Cabinet of Minerals, &c., were presented by Messrs. Felix Fossard, Rufus Tyler, and John L. Pearce, of Philadelphia; Calvin Mason, of York, Pa.; Timothy J. Dyre, of Fair Haven, Mass.

Prof. Franklin Bache presented a machine for dressing printers' types, formerly the property of Dr. Benjamin Franklin.

The Actuary laid on the tables the periodicals received in exchange for the Journal of the Institute, since the last meeting.

The Chairman of the Board of Managers presented the fifty-first quarterly report of the Board to the Institute, which was read and accepted; on motion, it was referred for publication.

The Treasurer presented his report of the finances of the Institute, for the quarter ending September 30, 1836, which was read and accepted.

Extract from the minutes.

Thomas Fletcher, *Vice President.*

Charles B. Trego, *Rec. Sec., P. T.*

Fifty first Quarterly Report of the Board of Managers of the Franklin Institute.

The transactions of the past quarter of the year, furnish but little new matter to be communicated to the Institute, as it has been marked only by the prosecution of the general scientific inquiries in progress at the last meeting, and in making preparation for the active duties of the approaching season. The second part of the Report of the Committee on the explosions of Steam Boilers, has been completed and published, and contains an elaborate scientific explanation of the causes of such disasters, and manifold directions and cautions by which they may in a great measure be avoided. A bill has also been prepared to be submitted to Congress at their next session, to enforce the use of the protective measures which the Committee have deemed important, to give perfect security in the use of so valuable an agent as steam. It is hoped that the return of the gentleman to whom the results of the experiments on the strength of the materials employed in steam machinery were confided, for the purpose of making a report thereon, will very shortly enable him to complete it, and when that shall be accomplished, the people of the United States will be put in possession of information on the interesting subject, embraced in the investigation, of

incalculable value to their commerce and manufactures. The Report on the subject of Water Power is still in hand, and will be published as soon as the complex nature of the calculations will permit.

The committee of the Institute appointed under a resolution of the General Assembly of the State of Pennsylvania, for the purpose of making the necessary scientific observations, to fix the standards of Weights and Measures for the Commonwealth, have been requested by the Governor to superintend the construction of the standards themselves; little has yet been done on the subject, but the zeal which has sustained our committee in the arduous experiments on water and steam, will not fail to secure for our own State a system of vast importance in the distribution of the heavy metals and minerals, which now form so large a portion of her trade. Passing from subjects of a more general nature, to those in which the members of the Institute are more interested, we have great pleasure in stating, that our able and accomplished Professors, Mitchell and Johnson, will commence their lectures on the first Monday of November next, and that they have made preparations for courses of more than common interest. The Committee on Instruction have also secured the services of Mr. Booth, whose interesting lectures on Technology were so much esteemed last winter, and he will give, on Friday evening of each week, a course of instruction on Chemistry, applied to the Arts, embracing the processes employed in the preparation of many articles of importance in domestic economy, which cannot fail to be highly valuable and instructive to the class. Our Drawing School will continue under the care of Messrs. Mason and M'Clure, and will open in a few days. Of its success under their management we have no fears, and with the full conviction that it is only necessary to announce the opening of the School, we leave it to the patronage of the members and the public. The Committee on Instruction feeling a deep interest in the success of the Evening English School, established about four years ago, have thought that a reduction in the price of tuition would obtain for it a more liberal patronage, and have accordingly proposed to the very estimable gentleman who has conducted it, to charge three dollars per quarter, instead of five dollars, requiring the pupils to furnish their own lights and stationary. His answer has not yet been received, but should it be favourable to the change, the Committee will make an early public announcement of the fact; if, however, he should decline undertaking it on the terms proposed by the committee, it will not be advisable to open it with the scanty number of pupils who have hitherto attended. To the Cabinets of Models and Minerals, and the Library, several additions have been made, and the Board would here notice the very liberal donations of money which have been placed at their disposal, by the members, for the purpose of being invested in Books and Apparatus, by our much esteemed member, Professor A. D. Bache, now on a mission to Europe. The Committee on Science and the Arts, are still actively engaged in the examination of the numerous machines which the fertile ingenuity of our countrymen is daily bringing forth, and is realizing all the advantages promised by its establishment in bringing the theoretical and practical mechanics of the Institute together, on a field where they can be mutually benefitted.

Owing to the unusual demand for money which has been experienced for some time past in this city, the Committee on the New Hall have not yet been able to negociate such a portion of the loan authorized by the Institute, as would warrant them in commencing the erection of a more commodious edifice for the purposes of the Institution, and though our means

of extending still further the usefulness of the Institution will be somewhat cramped by the necessity of providing the funds requisite to meet the interest accruing on the debt to the Grand Lodge, for the purchase money, yet the Board feel assured, that an institution so intimately connected with the Mechanic Arts, will not be suffered long to labour under a disadvantage entirely pecuniary.

The same zeal which has given it upwards of 2000 members, and hitherto sustained it under more trying circumstances, will still continue to animate its members, and in a few years more, endeared to the public as well by its important services in the cause of education, as by its invaluable investigations of the most important practical and scientific objects, the name of the Franklin Institute will convey a highly exalted idea of national greatness, and stimulate our sister institutions to a greater zeal in the promotion of the Arts and Sciences.

M. W. Baldwin, *Chairman.*

William Hamilton, *Actuary.*

The Second Monthly Conversation Meeting of the season was held at the Hall of the Institute, on the 27th of October, 1836.

The attendance was very full, and the meeting one of much interest: upon the table were some excellent specimens of wood engravings, executed by Mr. Reuben S. Gilbert; and a new working model of a compound screw press, for packing cotton, &c., invented by Mr. Joel Barns.

Messrs. Wallace, Chandler & Co., presented a beautiful specimen of iron casting, in imitation of the celebrated Berlin castings, from the foundry of Messrs. Crocker & Richmond, Taunton, Mass.

Messrs. Greenough & Farnum submitted for inspection, several pieces of white flannels, of superior quality, and said not to shrink in washing; manufactured by the Ballard Vale Company, Andover, Mass.

Mr. Philos Tyler exhibited a wheel tire, the inner surface of which was deeply indented by the grain of the wood composing the wheel: this phenomenon elicited from several of the members some curious and valuable information relative to the effect of great pressure upon metals and other hard bodies.

Toward the close of the evening, Mr. James P. Espy communicated a brief, but very interesting, explanation of some meteoric phenomena, of frequent occurrence.

Mechanics' Register.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MARCH, 1836.

With Remarks and Exemplifications by the Editor.

(CONTINUED FROM PAGE 329.)

61. For making *Vegetable extracts;* Thomas Close and John C. Sandford, Rye, West Chester county, New York, March 18.

"The process consists in forcing through the cut, bruised, or powdered, particles of vegetable substances, a volume of steam, water, or other liquid, under and by a pressure, varying in intensity, according to the nature of the substances to be acted upon."

This patent is not taken for any particular form of apparatus; but a description is given of one which is considered and claimed as new. The pressure is to be continued for a longer or shorter period, according to the nature of the substance to be acted upon, and it is said that "the colouring matter, tannin, and other soluble parts of the wood or vegetable substance will be immediately and perfectly extracted, and with the use of a much less quantity of water, and in much less time than would be required by the ordinary process of boiling, infusion, or steeping, leaching, &c."

The patentees claim to be "the original discoverers and inventors of the art of extracting the soluble parts of vegetable substances, by means of the heavy pressure of steam, water, or other fluids, exerted upon and through the materials to be acted upon, however the pressure may be effected. Also the combination of the chamber and perforated lid as described; the combination of the boiler, water pipe, and steam pipe, with said chamber, and its said apparatus for the purposes aforesaid."

The whole process is well described, and we are not aware of any theoretical, or practical, objection to it; but, on the contrary, it appears to us that for many purposes it may be used with great advantage.

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62. For a *Portable Cooking Stove;* Charles Vale, Newark, Essex county, New Jersey, March 18.

This stove, it appears, is intended to cook by means of anthracite, or charcoal, as fuel; but we are unable, from the description and drawing, to form any clear idea of its construction and use. There are letters of reference used, and figures referred to, in the description, which are not to be found in the drawing; we therefore must dismiss the affair.

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63. For an improvement in the *Art of Tanning;* Henry C. Locher, Lancaster, Pennsylvania, Administrator of Henry Locher, deceased. March 18. (See specification.)

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64. For an improvement in the process of *Manufacturing White Lead;* Horner Holland, Westfield, Hampden county, Massachusetts, March 18. (The specification will hereafter appear.)

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65. For a *Hemp Brake;* John Pursell, Perryville, Mercer county, Kentucky. March 18.

The Break is made in the ordinary form, the patented improvement consisting in working the vibrating swords by means of a treadle, in the downward stroke, and in raising them by means of springs.

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66. For apparatus for *Worming and serving ropes;* Adam Montgomery, city of New York, March 18.

By means of this apparatus, four strans of rope yarn are to be served at once. The yarn is wound upon a kind of bobbin or tube, with heads, through the centre of which the rope passes, and the heads of which are large, to enable them to contain a sufficient quantity of yarn. The tube of the bobbin projects beyond the heads, and on one end a weight is suspended to give a proper tension to the yarn; against the other, the worming, or serving, mallet works, and is turned by hand in the usual way. There is a tube on the end of the handle, and at right angles to it, through which the yarns are conducted in their passage to the rope, whence they pass

through holes in a piece of metal projecting from the head of the mallet, and guiding them into their places on the rope. When used for worming, the hollow of the mallet is to be faced with metal, forming a segment of a female screw. When used for serving, the mallet has a plane groove, as usual. The claim is to "the before described apparatus for worming and serving ropes, and the manner of operating the same."

In the 29th volume of the 2nd series of the Repertory of Arts, there is a description of a machine very similar to the foregoing, but nothing is said about winding several strands at once. This, as an improvement, would have been a proper subject for a patent.

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67. For *Manufacturing Salt from salt water;* Richard K. Cralle, Lynchburg, Campbell county, Virginia, March 18.

A very full description of the apparatus employed is given in the specification, after which the patentee says, "What I claim as my own invention, not heretofore known or used, in the above described machine, is the application of the principle of evaporation *in vacuo*, to the manufacture of coarse and common salt. I claim to have invented the means of applying a known principle in physics, to the new and useful purpose of salt making. The machine described, so far as its construction is peculiar to the purpose above, I claim as my own invention. The machine may be varied in construction, and the principle applied in other modes; but I claim to be the original inventor of the means of applying the principle of evaporation *in vacuo*, to the manufacture of coarse and common salt."

The apparatus, as shown in the drawings, is intended merely to exemplify the principle, and not to furnish a definite arrangement; the description of it is elaborate and clear, but we find nothing to designate in what "its construction is peculiar to the purpose;" and therefore cannot tell what is claimed; this ought to have been distinctly set forth, as, in our opinion, it would form the only foundation for a valid claim. It has been decided that the application of a known machine to a new purpose is not patentable. To apply the same mode to the evaporation of water from a solution of salt, which has been applied so extensively to its evaporation from a solution of sugar, cannot fairly be called an invention, however useful it may be. If geese had never been roasted, although turkies had been usually cooked in that way, a patent for roasting geese would hardly be sustainable.

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68. For a *Metallic Mill;* Joseph C. Gentry, Dayton, Montgomery county, Ohio, March 18.

A cast-iron cylinder is to be banded, or otherwise covered, with cast-steel, then turned smooth, and picked with a pointed, steel tool. A concave of cast-iron, forming nearly a half circle, is to be adapted to the cylinder; and ribs, or bands, of cast-steel, projecting about one-sixteenth of an inch from its surface, are to be inserted in dovetail grooves, extending the whole length of the concave; these also are to be filed on their surfaces. The concave must be sufficiently open at one edge for feeding, and the cylinder is to be held down by springs, to prevent injury from the introduction of hard substances.

"What I claim is the steel or other metallic ribs, and the manner of fix-

ng them in the concave. And the cast-steel or other suitable metal, plated or banded on the cast cylinder. The manner of relieving the action of the cylinder by springs back of the boxes, on which the journals rest. The manner of picking the cylinder and ribs, presenting the sharp edges to each other, as described above."

Such a mill would be costly, easily put out of order, and difficult to repair. We are very apprehensive, also, that, when in the best order, it would not make very good flour. The claims embrace too many individual parts of the mill, some of which would not be able to stand alone.

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69. For a *Mortising machine;* George Page, Keene, Cheshire county, New Hampshire, March 18.

The general resemblance in principle between this and some mortising machines which have preceded it, is such as to leave little apparent room for a claim, and it does not occupy a large space, being to "the mode of attaching the slide to the upper lever and that lever to the machine; and also the lower box, and circular brace as described." We shall not take time to describe these particulars, but have no doubt that they are equally good with other modes of attaining the same end, and that the machine, if well made, will work well.

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70. For a machine for *Cleaning and Dressing Feathers;* Elam Wilbur, Geneva, Ontario county, New York, March 18.

Feather dressing machines bid fair to become as numerous as churns and washing machines, whilst, so far, they differ as little from each other as do a number of the former instruments. The claim in the present case is to "the steam chamber for generating steam in a separate chamber, or chest, from the case in which the feathers are placed; and the wings for blowing out the feathers at the door at which the opening in the ticking is placed to receive them."

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71. For a *Door Lock;* James M'Clory, City of New York, March 18.

The claim made is, to "the guards, the plates of tin placed between them; the levers and bar; the application of a double bitted key to this lock, and the mode of operating the several parts."

The drawing gives a very imperfect representation of this lock, and the claims extend to things which have no novelty when taken individually, as is done in the foregoing summary. The guard, are flat plates of metal laying upon each other, and operated upon by the key; the cam, or bit, of which is in steps, so as to push the plates to different distances, in disengaging the bolt. Double bitted keys have been frequently used; the mode of operation in some of the parts is new, but this is not the case generally. The lock is probably a very good one, and we believe that it has sufficient novelty to admit of a sustainable claim.

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72. For a method of *Making Pitch;* Henry Ruggles, city of New York, March 19.

The refuse, or tar, such as is left in making gas in the New York gas works, is to be boiled down to the consistence of pitch, and then put into barrels.

"I claim the exclusive privilege of boiling down, either in an open or

close vessel, kettle or still, the liquid such as is produced at the New York gas house, in the manufacture of gas, and known there by the name of refuse, until it becomes of the thickness, or consistency, of pitch."

The distilling of the spirit from the refuse, or tar, of gas works, so as to reduce it to the consistency of pitch, is a common and well known process in London, and in other places where there are large gas works; the *exclusive* right, therefore, is not likely to be conceded.

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73. For *Backs of stoves and fire places;* William R. Prescott, Hallowell, Kennebec county, Maine, March 19.

A tube of suitable diameter, say nine inches, and two or three feet long, is to be built in the back of a fire place, or fixed, in any convenient way, in a stove; a tube, of about two inches diameter, is to lead from without the room, into this longer tube, to supply it with cold air, and warm air tubes are to lead from either end of it, into the room, to afford a supply of warm air.

The claim is "to bringing, in the manner described, the cold air from without the room to which the fire place is situated and supplying it to the stove, and of thus keeping up a circulation of cold air from without, and of warm air into the room. The application of the apparatus described for fire places, stoves, and fire frames, for the purpose of warming rooms, and its general construction."

Whilst there is nothing new in this principle, the form pointed out for carrying it into effect would be one of the least efficient; the "general construction" is so general, and so extensively employed, that it is a little remarkable it should be claimed as new.

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74. For a *Furnace for generating steam*, on board of steamboats, and for other purposes; Eliphalet Nott, Schenectady, New York, March 19.

The improvement consists in giving a coating of silicious matter to the insides of furnaces for burning anthracite, so as to prevent that fusion which takes place when the lining is argillaceous, and also in covering the grate bars, or bottom of the furnace, with fragments of such stones as are suitable for the purpose, to protect the bars from the action of the fire. Each of these applications is claimed for the use of furnaces for steamboats. There is no adequate information given respecting the first application; we are merely told that the coating is to be performed "with some other material, (as silex) that will not flux by the mere action of the fuel in use; the same to be put on in the form of grout, as similar coatings are put on to melting furnaces, to prevent the action of the contents on the crust thereof." Now silex cannot be so put on, it not having the slightest adhesive property; and if mixed with clay, the two make a fusible compound. Nothing, we apprehend, is secured by this part of the patent, as there is not any thing practically explained.

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75. For an improvement in combined *Pen and pencil cases;* Henry Withers, an alien, who has resided two years in the United States; city of New York, March 19.

For this pen and pencil case, the two instruments are to be used at the same end, either of them being protruded at pleasure. The pencil holder, with its ordinary adjustments, slides through the tubular pen holder,

and the claim is made to "a pencil holder of any known or convenient structure, made so as to pass through, or by the pen holder, in his said combination."

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76. For a *Forge anvil block;* Samuel Van Tiers, M'Connelsburg Bedford county, Pennsylvania, March 19.

"The crib, sills, cellar or spring planks, and bed timbers, are made and arranged in the usual manner. Instead of the usual mode of having a wooden block upon which the anvil is placed, secured by the braces, props and wedges, my improvement consists in casting the anvil block of cast-iron, in a pyramidal figure, with a cavity to receive the anvil; it has flanches through which are apertures to admit strong screw bolts, by which to secure the anvil block to the bed timbers and spring boards. The bolts are passed through apertures in the spring boards, bed timbers, and the flanch of the anvil block, and secured by rivets resting upon the upper surface of the flanch, the other end of each bolt having a broad head bearing against the under sides of the spring boards."

"What I claim as my invention, and for which I ask a patent, is the cast-iron anvil block, and mode of securing the same, as before described."

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77. For a mode of *Conveying rafts, boats, &c., over dams and shoals;* Stephen Underwood, Bath, Grafton county, New Hampshire, March 19.

Two inclined, plane rail-ways are to be erected, one on each side of the dam, or other obstruction, over which a boat, &c., is to be carried; these are to extend into the stream, so that the load can be floated on to a car, constructed to run upon the planes. The planes are to terminate, at their upper ends, at the distance of from thirty to sixty feet from each other, or equal to that of the car upon which the boat or raft is to be carried. This space is occupied by a vibrating rail-way or bridge, which tilts on a centre, and will form a continuous plane with either of the sections accordingly as it is tilted towards the one or the other. A windlass, turned by water, or other power, receives a rope, or chain, by which the car can be raised, or lowered, upon the planes. When a load is to ascend, the bridge is tilted towards the plane up which it is to be drawn, and it is hauled upon it; the bridge is then tilted towards the descending plane, and the load is lowered into the water.

There is a contrivance on the car, by an arrangement of eccentric rollers, by which the level of the load can be changed, so that it shall stand horizontally in ascending and descending.

The claim is confined exclusively "to that part of the apparatus employed, which is denominated the *vibrating rail-way*, which is intended to receive the load at the summit of the inclined plane, and to be adapted by its vibrating motion to the plane of either, for the purpose, and in the manner set forth."

This plan has been carried into successful operation; large rafts of timber being conveyed, by its means, down rivers where the passage was previously attended with extreme difficulty, and where it could not, sometimes, be effected.

78. For an improvement in the process of *Tanning hides and skins;* Laban Emery, city of New York, March 19.

The patentee directs the hides, or skins, to be prepared for tanning in the usual manner, and adds, that "my improvement or invention then consists in the application to the bark liquor, of nitre, or alum, or epsom, or Rochelle, salts, or other neutral salts, either separately, or together, mixed in with the liquor, in the proportion of about four pounds to four dozen skins, more or less; and also bearing some proportion to the strength of the liquor. Every time the bark liquor is renewed, a like quantity of such neutral salt may be added, or not, as may be thought proper, or as the process of tanning may be required to be hastened. Either of said articles may be used separately, or together, in the process of tanning morocco, as well as every other description of tanning."

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79. For *Preserving milk for use on voyages, &c.;* John Lewis Granger, city of New York, March 19.

Fresh milk is to be put into bottles, and these are to be closed, in the manner of corking, with some porous substance, which will allow air to pass through it; the bottles are then to be put into a vessel of cold water, and the whole gradually heated to the boiling point, after which the porous stopper is to be covered with wax.

The claim is "to the evolving of gas, and suffering it to escape from the milk, and immediately afterwards excluding the atmospheric air from commingling therewith, by the method substantially as described."

We apprehend that the theory above intimated, namely, that the gas contained in milk is the cause of its spontaneous decomposition, is not founded in fact; were this the case, an exhausted receiver would as effectually effect the object in view, as the boiling heat, and this process would not be "substantially as described." There is a chemical change produced in milk by boiling, by which its liability to further reaction is very much diminished, and which would not be produced by the mere expulsion of gas. This theoretical point, we are aware, has nothing to do with the validity of the claim, although we have thought proper to give it a passing notice; we have also something to say about the novelty of the process. In the celebrated report published by the French Government in 1810, on Mr. Appert's mode of preserving all kinds of animal and vegetable substances, milk is mentioned as having been preserved by boiling and corking closely; it was concentrated in the boiling by allowing a portion of its watery particles to evaporate; the process was, we think, substantially the same with the above, the principle of which was perfectly well known.

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80. For a *Cider Mill;* Christian Sheaffer, Lebanon, Lebanon county, Pennsylvania, March 19.

This cider mill is to grind the apples by means of revolving nuts or, toothed cylinders, of which there are three, mashing into each other. All the novelty appears to be in the manner of building the mill. We are told that "the machine consists of two pair of stairs, a frame, an apple mill made of three cog wheels; cage or receiver, a press beam, two main screws, one assistant screw; two weight boxes, &c. &c." After describing the two pair of stairs, and the other component parts of the machine, it is said, "I claim as my invention the whole of the machinery, excepting what I have named the cage or receiver; the bed or box belonging to the cage or receiver, and

the manner of mixing the straw with the ground apples, or rather the *smashed* apples." This claim to the whole machinery, cannot be understood to mean the machinery as a whole, but as applying to its component parts individually; scarcely one individual of which could bear the burden thus put upon it, without being *smashed.*

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81. For a *Cooking stove grate*, and its appendages; Orrin Wilson, Concord, Middlesex county, Massachusetts, March 23.

The grate to contain the coal, or wood, is made with bars, and, in general, like the ordinary grate of an open fire place; but it is so affixed to a cooking stove, with ovens, or other desired appendages, as that it may be raised vertically, so as to communicate its heat more directly to the cooking department, or lowered so as to form an open stove. Above the grate, a windlass crosses, near the front of the stove, and four chains attached to this windlass, and to the four corners of the grate, serve to raise and lower the latter, as may be desired.

The claim is to "the movable grate, or pan, whether operated with chains and pulleys, rack and pinion, or other mechanical powers; the peculiar adaptation, arrangement, and combination of the several parts of the stove, fire frame, or fire place, to the said movable grate, for the uses and purposes herein described and set forth."

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82. For a *Stove*, denominated the Sibelline Stove; Wm. M. Carmichael, Hempstead, Queens county, New York, March 23.

A cylindrical stove, lined with fire clay, is made in the usual manner. The stove is to be surrounded by a second cylinder, leaving an air chamber between the two, with apertures below to admit cold, and others above to discharge warm, air. The whole stove is to stand upon a drum, or pedestal, of a diameter considerably larger than the stove itself, and is to be surmounted by another drum, or hollow dome, elevated a few inches above its top; a smoke pipe from the centre of the top of the stove, conducts the smoke into the drum. Four, or more, hollow columns, connect the two drums, surrounding, but detached from, the body of the stove; these columns form flues between the two drums, and from one of them a smoke pipe leads into a chimney, there being a damper in the column, above the smoke pipe. When this damper is open, the smoke and heated air pass directly through the upper part of the column, and into the exit pipe. When the damper is closed, the draught has then to pass down the three open columns into the lower drum, and up the fourth to the smoke pipe.

"The arrangement and adaptation of the several parts of the stove, producing the one before described," constitute the whole claim, which is about tantamount to not claiming any thing. The resemblance between this and the stove patented by Mr. Attwater, at p. 54, vol. xvii. is not very remote; and this latter, as is there described, we view as but a modification of Spoor's stove.

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83. For a *machine for manufacturing shoe pegs;* Reuben H. Thompson, Rochester, New York, March 23.

"The principal points upon which the inventor depends, is the *cutting* of pegs, instead of *splitting*, and the making them from a long cylinder of

wood, in a continuous course to the centre, and completing the peg from a solid block, wholly by machine power."

We cannot describe this machine without drawings of its parts. It is clearly enough described and represented, but the foregoing claim refers merely to the thing done, and not at all to the means by which it is effected; it has no bearing, in fact, upon the machine that is the subject of the patent, and which is, certainly, sufficiently original to have been directly claimed.

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84. For a *Cot Bedstead and Camp Stool;* Samuel Clark, city of New York, March 23.

The pin which connects the cross legs of this cot bedstead, or stool, is a toothed pinion, the teeth of which take into racks formed in a slot, or mortise, in either leg, and acting in such way as to stretch the sacking, by the weight placed upon it. A stretcher also extends across from one leg to the other, and the head board is so connected to the side pieces, as to allow them to recede unobstructed. The claim is to "the application of the stretching bar, and the movable rack and pinion joint, to the cot bedstead, and articles of a similar construction." The device is simple, but ingenious, and appears likely to answer a good purpose.

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85. For a machine for *Working off the ends of casks, and smoothing them;* Sumner King, Suffield, Hartford county, Connecticut, March 23.

A vertical, revolving shaft is to carry a grapple, or a kind of spring chuck, which is to receive and hold the cask that is to be worked off by a leveller, a stock howell, a croes, and a plane. The claim is to "the revolving grapple tub, that secures the cask."

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86. For an improvement in the art of *Dissolving Caoutchouc, or India Rubber;* Patrick Mackie, city of New York, March 23.

"What I claim as new, and of my invention, is the use of oil of tar, or spirits of tar alone, and also the use of oil and spirits of tar mixed with the prepared sulphate of zinc, as a solvent for dissolving india rubber, for the purposes aforesaid."

We could turn to patents for the use of the same liquid, in the employment of which, therefore, there is not any thing new. The spirit from coal tar has been extensively used in England, and is well known here, but its odour is extremely offensive. The spirit from common tar is principally oil of turpentine, with empyreumatic matter, which does not improve it.

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87. For a *Washing machine;* Ezekiel Y. Watson, Albany, New York, March 23.

An oblong box, furnished, in its bottom, with a curved row of rollers, upon which the clothes are to be rubbed by a frame of rollers passing over them, constitute the machine; and "the before described machine for washing clothes," forms the claim.

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88. For a *Cannon vent;* John W. Cochran, Lowell, Massachusetts, March 23.

The thing here proposed is to place the vent of a cannon, by which the

powder is ignited, considerably forward of its usual position, so that the fire may be communicated near the centre of the charge.

"In the position of vents now actually adopted, the charge is ignited at the bottom, and much of the powder is often thrown out of a cannon without being fired at all. This applicant contemplates the application of the principle of his improvement by placing the vent as far forward of the bottom of the breech, as the outer part of the powder may extend, and to put two or more vents in similar positions."

The idea of placing the vent as proposed, is without novelty, and has been frequently discussed by engineers. The following extract from Lallemand's Artillery, N. York. 1820, p. 18, is given in proof. "It is agreed upon all sides, that the vent of a piece of artillery would be most advantageously placed if it communicated the fire to the centre of the charge; for, in this case, the inflammation of the powder, which is not instantaneous but successive, takes place soonest. However, it is usually made to enter the bottom of the charge, to avoid too violent a recoil, that would derange the fire, and injure the gun carriages; particularly those of larger caliber."

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89. For a *many chambered cannon;* John W. Cochran, Lowell, Massachusetts. First patented October 22d, 1834. Surrendered and re-issued upon an amended specification, March 23.

We noticed this invention at p. 326, vol. xv., and expressed an opinion that the use of a gun constructed like that described, would be attended with extreme danger. Since that period, however, the thing has been tried to some extent, both in this country, and at Constantinople, and as it appears, from all the information which we have gleaned upon the subject, without the realization of any of those difficulties which we apprehended. We are well convinced, in fact, upon more mature reflection, that some of the objections to it which we then deemed the most formidable, were not well founded; but we have not time, nor is it necessary, to discuss this subject here; it would afford us sincere pleasure, had we more frequent occasion to withdraw our objections to patented inventions.

The claim now made appears to us unnecessarily verbose; it amounts, however, simply, to the combination of a cylinder with a section of a cannon, the cylinder perforated on its periphery to receive the charges, and made to revolve by suitable devices, so as to effect the proposed object substantially in the manner described.

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90. For a machine for *mortising and tenoning;* Erastus M. Shaw, Wilbraham, Hampden county, Massachusetts, March 23.

This machine differs in its general construction from most of the mortising machines which we have previously noticed, and by more labour than we can bestow upon it, we think that we might find out the manner of constructing it; but the drawing is very indifferently executed, and to decypher it is a task we shall not undertake. The claim is to "the arrangement and adaptation of the several parts of the machine, producing the one here described for mortising and tenoning timber; particularly the manner of operating the machine, in causing the carriage to move to the right and left, whilst the slide, with the cutter, moves horizontally backward and forward, at right angles to the carriage."

91. For *Condensing cotton roping, or slubbing;* William Fowler, Fishkill, New York, March 23.

"The principle of this improvement consists in the compressing of the sliver by means of a revolving groove, into which it is pressed by a revolving periphery pressing into and revolving with said groove, the said revolving groove and periphery constructed substantially, as aforesaid, and combined with a spool constructed and moving so as to take up this sliver when thus condensed, or compressed into roping spirally, as described."

To the idea of this invention given in the foregoing summary; we add that it consists of revolving wheels of about seven inches in diameter, and about three-eighths wide, having a groove, on its periphery, about one-tenth of an inch wide, and the same depth; four small, condensing wheels, each about one inch and a half in diameter, have tongues or fillets, which run in the grooves, and condense the roping, thereby producing the necessary firmness without the twist and counter twist, usually given by the condensing apparatus.

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92. For a *Straw Cutter;* James Hyde, Darien, Gennessee county, New York, March 23.

There not being any claim made to any part of this apparatus, we know not what the patentee considers as new about it, and therefore pass it by.

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93. For a *Thrashing machine;* Hugh and Israel W. Edgar, Wayne county, Ohio, March 23.

This is a cylinder and concave machine, set with spikes, much in the usual way; the patentees claim the form in which they construct the frame, and the manner in which they fasten the spikes by screw nuts, rendering the whole strong and durable.

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94. For a *Rotary Steam Engine;* David Ulam, Greensburg, Westmoreland county, Pennsylvania, March 23.

A hollow drum, furnished with an opening to admit, and another for the discharge of, steam, is to have a wheel or drum, revolving in it, of such size as to leave a steam chamber between them. A projecting piece on the inner drum fills this cavity, and is made to recede, by suitable means, when it must pass the stops against which the steam is to react. The whole thing is nothing but an oft-told story, without a single new incident to redeem its monotony; but old as it is, and wortniess as it will prove to be, the patentee says, "what I claim as my invention, and which I desire to secure by letters patent, consists in the before described rotary steam engine."

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95. For a *Stone Auger, for boring rocks;* Andrew Turney, Reading, Fairfield county, Connecticut, March 30.

The main point upon which the claim under this patent rests, is the forming of the point of a stone drill, with a sort of knuckle joint, so that when inserted into a hole which has been drilled cylindrically by a common drill, the joint will bend on one side, and enlarge the hole at the bottom, that a larger charge of powder may be introduced, and its force increased. There is also a claim to the working of the auger with a spring, and to the kind of scraper used to remove the drillings. We doubt altogether the utility of the invention, as the apparatus is constructed, but cannot form a fair judgment from the evidence before us.

96. For an improvement in *Bee Hives;* Sturgess M. Judd, Danbury, Fairfield county, Connecticut, March 30.

The hive said to be improved, is that patented by Levi H. Parish, on the 5th of August, 1834. The claim made "in the suspension of said boxes, and in their movement, and in their movement in grooves, by which the bees are prevented from escaping during the removal of the boxes, as combined in the manner specified; and also the knives for separating the combs between the boxes and the slats." The peculiarities of these parts we leave to be examined by those interested in them.

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97. For an improvement in a *Suction and Forcing Pump, for fire engines;* John F. Rogers, Waterford, Saratoga county, New York, March 30.

A patent was obtained by the same gentleman, on the 27th of February, 1833, for a pump upon the same general construction with that which forms the subject of the present patent. We gave a pretty full description of the former, in vol. xii. p. 103. The claim under the present patent, will, with the aid of the reference just made, afford a tolerable idea of the nature and object of the proposed improvement, which, it will be seen, is to remove one of the objections made by us to the former construction.

"What I claim are the openings through the shaft by which the water is passed through the pump more direct than can be done in any other way, thereby removing the obstruction of the water caused by changing its direction."

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98. For an improvement in the *Power Loom;* Francis C. Lewis, Grafton, Worcester county, Massachusetts, March 30.

The claim under this patent refers to the drawings, and without these, therefore, could not be understood. The following quotation will furnish the object of the improvement, but not the means by which it is attained.

"The great practical advantage of my improvement is, that the weft is driven up by the reed, while the cloth roller is stationary, and there is no power operating upon it, so that the thread of the weft, and the cloth, receive the full blow of the latter; whereas, by the looms formerly in use, the cloth recedes, and is taken up as the latter strikes."

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99. For a *Horse Mill for grinding grain and scouring seeds;* John Harman, Jr., Brownsburg, Bucks county, Pennsylvania, March 30.

The grinding machine consists of two grooved, iron, cylinders, of different sizes, and running with different velocities; one of them having a narrow, fluted, iron concave to aid in the grinding. A horse power, by which the mill is to be driven, is also described, but there is not any representation of it in the drawing; both machines, however, are claimed; the claim being to "the combination and arrangement of the several parts of the horse power in connexion with the grinding machine, as set forth."

However good the inventions might be, the foregoing claims would invalidate them. The whole grinding machine is claimed, yet it possesses but little novelty; the horse power is claimed, yet there is no representation of it, as required by law. And what would of itself be fatal, two distinct machines are included in one patent.

100. For applying *Rivets to harness and gears;* William Dukeheart, city of Baltimore, March 30.

The claim made is the using rivets of metal, in the making of harness, instead of sewing, or stitching, as formerly practised.

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101. For a *Tide Water Wheel;* Carey S. Mercer, Franklin, Baltimore county, Maryland, March 30.

A horizontal wheel is to be placed in a case, or drum, having flooms at opposite sides thereof, to direct the water upon the buckets, either on the ebb or flow of the tide; guide pieces, or wings, are fixed within the flooms to direct the water upon the buckets; and the claim made is to "the curved guider as described." The contrivance is not worth many words, and we could not talk it into utility.

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102. For an improvement in the mode of *Spinning Wool;* John Wethered, Baltimore county, Maryland, March 30.

"What I claim as new in the machine herein described, and for which I ask an exclusive privilege, is the combination of a tube and other means, of giving a rotary motion to the sliver, with two or more sets of rollers of different speeding, a tube between each set, whereby a twist is given to the sliver, roll, roping, or slubbing, while it is passing from one set of rollers to the other, so enabling it to bear the elongation produced by the different speeding of the sets of rollers, in order to make it of the proper size for spinning: and I should consider any contrivance by which the strength of the sliver was increased by twisting between the sets of rollers, as an encroachment upon my invention."

The foregoing will suffice to inform those used to spinning machinery, of the nature of this invention; the object of which differs, as the patentee observes, from that of the revolving tube previously in use for condensing the sliver as it leaves the carding machine, to fit it for winding on the spools. The invention appears to be well adapted to the accomplishment of the end proposed.

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103. For an improvement in the *Cotton Planter;* Michael Beam, Buffalo, Lincoln county, North Carolina, March 30.

This patent is obtained for an improvement on a machine patented by the same person, Feb. 13th, 1835. The present contrivance consists, in part, of a barrel shaped reservoir, in which the seeds to be planted are put, and which revolves, as the frame upon which it is supported is drawn forward; it has adjustable openings, for letting out the seed, an apparatus for opening the furrow, and a harrow for harrowing the seed in. The points intended to be claimed consist of the peculiarities of form, structure, and arrangement, which are not very clearly described, and could not be understood without drawings.

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104. For a *Double Reflecting Lamp;* John C. Fletcher, Springfield township, Clark county, Ohio, March 30.

The lamp here described is of the hanging kind, the reservoir for the oil being formed like that of the astral lamps, so that the light can pass downwards without obstruction. There are to be reflectors above the light, polygonally formed, and sloping from the glass chimney upwards; the inside of the reservoir, also, is to be lined with similar reflectors, and around its

lower edges there is a trough for catching the drippings of oil. We are of opinion that these latter reflectors will produce but little advantage.

105. For a *Hat Block;* Wm. W. and S. H. Jimeson, Wheeling, Ohio county, Virginia, March 30.

This block is to be in six pieces, four outside pieces, two of them formed by cutting opposite segments from top to bottom, off the opposite sides of the block, and the other two by cutting the middle segment across, so as to leave a square centre piece, somewhat pyramidal in form. There are to be tongues formed up each side of the centre piece, and corresponding grooves in the side pieces, extending to within an inch of the top, serving to prevent all lateral slipping. In steaming, the centre piece is to be plain. There is to be a Boss block, of the usual construction; and to the bottom of this a *circular pedestal* is to be attached, by a bolt passing through the centre of each. The claim is to "the before described block for finishing hats, especially the tongues and grooves, and the circular pedestal which permits the block to revolve freely whilst finishing hats."

106. For forming *Joints for Bedsteads and other wood work;* Solomon C. Batchelor, and Nelson S. Thomas, Watertown, Jefferson county, New York, March 30.

The patentees claim, "being able to frame, by means of keys, right angled works, where the rails, or timbers are on the same level," and we have looked into the thing, with more than common care, to find something about it "not previously known;" but we have not been able to discover any thing which is not well known to every workman who has made mortises and tenons. The rails are to be tenoned into the posts in the usual way; one end of the tenon to be cut dove-tailing, and the mortise sloped to suit it; a wedge, or key, is to be inserted at the other end, and the work is done. In this simple and well known affair, it would be difficult to assign to each of the two patentees, the amount of his inventive contribution.

107. For a *Vertical Wool Spinner;* William Sykes and George M. Conradt, Fredericktown, Frederick county, Maryland. First patented March 10th, 1834. Surrendered, and re-issued upon an amended specification, March 30.

The object in view in this patent, is the same with that of Mr. Wethered, No. 102, but the means of attaining it are different. The following is the claim, "What we claim as our invention, is the constructing of drawing rollers for spinning machinery, in such a manner as that they shall embrace the thread between them during a part of their revolution only; allowing it to twist freely, unobstructed by them during the remaining period; by which means we are enabled to carry the twist directly from the flyers up past the drawing rollers, without employing any intermediate machinery; using in conjunction with such drawing rollers, either live or dead spindles, and such other parts as are ordinarily employed in spinning machines, and to which we make no claim."

The proposed mode of relieving the thread from the action of the drawing rollers, is by cutting off a portion from one side of them.

108. For an improved *Franklin, or Open Stove;* John H. B. Swansey, Lynn, Essex county, Massachusetts, March 30.

"The improvement made by me is the addition of two more flues, or drafts,

beside the common ones in the Franklin stove. One of said additional flues is to be made a little above the middle of the fire back, and to extend horizontally the whole length of the back, and is to be provided with a common damper, to open and close it. The other additional flue is to be placed along the front plate of the stove."

The drawing does not exhibit the thing very clearly; it does not, however, so far as we can judge, appear to be an affair of much importance.

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109. For *Compressing Hay, &c., and elevating heavy bodies;* Adrastus R. Chamberlin, and Artemas Cleflin, Richmond, Lincoln county, Maine, March 30.

A pinion and wheel are to turn a shaft, round which a chain is to wind, which chain passes over a pulley at the end of a piston rod, that is to carry the follower for pressing. The other end of the chain is to be fastened to some fixed body. Instead of passing over the pulley, on a follower, the chain may be attached to a stump which it is desired to draw from the ground.

The claim is to "the application of the pulley as used by us, for a single or double press; and the application of our machine to the raising of stumps or other heavy burdens." There are so many better machines, for effecting the same purposes, that this will stand but little chance of going into operation; or if it has been used, we apprehend that it will soon cease to be so.

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110. For an improvement in *Wind Mills;* Job Wilbur, Fall River, Bristol county, Massachusetts, March 30.

This is to be a horizontal wind mill, to contain the vanes, or wings, of which, a round building, thirty feet high, and twenty in diameter, is to be erected; the upper part of this building, is made to revolve on the lower, in order to change the situation of two windows, or openings, made for the admission and discharge of the wind. Six vanes, placed on a vertical shaft, in the centre of the building, are to receive the action of the wind; these vanes are to be angled to hold the wind the more effectually.

There is no claim made, a point, in the present case, of no great importance, the structure being very much like others which have been tried, and abandoned.

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111. For a *machine for manufacturing Axes;* Elisha K. Root, Canton, Hartford county, Connecticut, March 30.

We shall hereafter notice this machine, in conjunction with some others in use, at the axe manufactory in Collinsville, Connecticut, to which establishment we, a short time since, made a visit.

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112. For a *Forcing Pump;* Nathan Chapin, Penn-Yan, Yates county, New York, March 30.

We see no reason to attempt a description of this double barreled forcing pump, as we cannot discover any valuable point in it beyond such as are in ordinary use.

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113. For a *machine for ploughing and thinning cotton;* Harvey W. Pitts, Wilsonville, Shelby county, Alabama, March 31.

The claim made is to "the machine as described," a claim which it will hardly bear, as parts of it are very similar to machines which have been

used for like purposes; yet we believe there is sufficient novelty in the contrivance to enable it to sustain the character of a new machine. We shall not take time to describe it, as it would be no easy task to render it intelligible without a drawing.

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114. For a *Corn Sheller;* Albert W. Gray, Middletown, Rutland county, Vermont, March 31.

This machine is to operate upon the ears by means of a revolving, flat wheel of wood, set with points, and standing vertically; the ears are to be held up against it by means of a spring conductor. The general arrangements are very similar to those in other revolving, disk shelling machines, and the particular points and combinations which are made the subject of a claim, appear to be unimportant, not, we apprehend, rendering it either better or worse than others previously in use, and now public property.

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115. For *Wagon and Carriage Springs;* Newell Hungerford, Ithaca, Tompkins county, New York, March 31.

Spiral springs which are wound round an iron bar crossing the carriage, and attached to the bar at their inner ends, are, at their outer ends connected to the bottom of the body of the carriage, or wagon. The round bar, above named, is supported at the two ends by a bowed piece of iron, bolted to the axle through its middle. The specification ends abruptly, without pointing to any novelty, or making any claim. A single coil of spiral spring will not fulfil the intention of a carriage spring; it has been tried in various ways.

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116. For an *Awl Shaft;* David M. Smith, Gilsum, Cheshire county, New Hampshire, March 31.

The wooden part of this haft is in two pieces, the lower piece containing the socket, and fitting, and revolving, in the upper one by means of a round pin; the wood part of the socket is bored tapering, and has in it a split, metallic socket, into which the shank of the awl is inserted, when, by turning the two parts of the haft upon each other, a nut draws the split socket inwards, and holds the awl.

The claim is to the "constructing an awl haft, so as to move the split socket in and out, into which the shank of an awl blade is inserted, and by which it is held firmly, as above described."

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117. For an instrument for *Cutting the Soles of Boots and Shoes;* Jonathan Hill, Billerica, Middlesex county, Massachusetts, March 31.

A knife is to be made in the form of the sole to be cut, and this is to be pressed on to the leather by a press, or in any other convenient way. Two iron bars are described, which are to lie along the back, or upper side of the knife, from heel to point, but these are not an essential part of the contrivance. The affair is not new, such knives having been made, and patented, both for cutting uppers and soles. The claim is to "the construction of the knife, being entirely in one piece; and the application of the same to the purpose of cutting soles, by means of a lever, or lever press.

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118. For *Reflecting Ovens;* Cicero Van Allen, Penn Yan, Yates county, New York, March 31.

In the claim appended to the specification of this reflecting oven, we are

told about two new principles in it, yet we are at a loss to discover one; it is so much like some other tin kitchens, for baking and roasting before the fire, and our eye so little like that of the inventor, that we cannot see the new parts to which he believes that he directly points. The sides, back, and bottom appear to be rectangular, and the top to slope regularly back; there is a spit for fowls, hooks for birds, bars on which to place pans, a dripping pan to catch the gravy, and a peep hole through which to observe how matters go on, and these constitute the "single reflecting oven."

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119. For a *Self moving and accumulative engine;* John James Giraud, city of Baltimore, March 31.

How many self-moving and accumulative engines have the same parentage with that before us, we cannot recollect, and do not think it worth while to examine, in the patent office, the register of their births; as to their deaths, no register exists, they having all been still born; we know, however, that the family would have been a large one had they received and preserved the living principle. We can tell little about the affair before us, but its author informs us that "the fly wheels run on friction wheels, bearing on the main shaft, and constitute the generating, regulating and maintaining powers of the engine." The power thus generated, regulated, and maintained, is to be applied to "general navigation and other purposes." Happily for the community, however, neither general navigation or other purposes which demand motive power, will consent to wait the generating, regulating, or maintaining power of Mr. G.'s accumulative engine, as otherwise they would never be generated, regulated, or maintained.

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120. For a *Churn;* Thomas Nicholson, New Market, Shenandoah county, Virginia, March 31.

A churn, with a tub in the ordinary form, has a dasher shaft, which is to revolve alternately in reversed directions; for this purpose there are two beveled pinions upon the shaft above the lid; and a beveled segment wheel is to engage first with one, and then with the other of these pinions; such a contrivance is bad in principle, as all machinists know; segment wheels being generally poor things, and, as here applied, altogether worthless.

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121. For *Pronged Hoes;* Benjamin F. Boyden, Boston, Massachusetts, March 31.

These hoes are to be of cast-iron, rendered malleable in the usual way. They are to have raised ribs along the prongs, &c. to strengthen them, and to be tinned over their whole surface. The claim is to "the application of cast-iron in the manufacture of agricultural pronged hoes, and covering the same with tin;" but where is the invention or discovery?

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122. For an improved *Winnowing machine;* Jonathan Bean, Montville, Waldo county, Maine, March 31.

We are told that "the advantages this machine claims above others now in use, consist in durability, portableness, and expedition in cleaning all kinds of grain;" but although the machine claims this, the patentee does not claim the machine; and although he has given a voluminous account of admeasurement, and many outlines of separate parts of it, its construction

is very imperfectly represented, and its peculiarities, if any it have, are unnoticed; the patent, in fact, is a patent for nothing.

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123. For *Hose to convey water;* Samuel Hunt, city of Baltimore, March 31.

"What I claim is the application of hose, whether constructed in the manner set forth, or otherwise; not intending to confine myself to particular dimensions or materials in its construction, for the purpose of carrying good and wholesome water, for the use of cities, towns, and villages, &c. across rivers, ponds, bays, creeks, or elsewhere."

There are two doubtful things in this patent; first, it is much to be doubted whether a man can be prevented from conveying water in a hose, through a creek, &c.; but a more important point is the doubtful utility of the thing, for the purpose intended. A flexible hose, large enough to convey a supply of water for the consumption of towns, it will be difficult to make, more difficult to fix, and most difficult to keep in order.

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124. For a *Blacksmith's Tew Iron;* John Shugert, Elizabeth, Alleghany county, Pennsylvania, March 31.

"The improvement claimed by the petitioner, is the angles in the pipes and plates, by which it is made entirely fire proof, or indestructible."

How this desirable end is to be attained by the construction of the instrument described, we do not perceive. An iron back is to be made to the forge; the pipe which leads to the opening for the blast, is to be ten, or twelve inches in length; the hole through it about two inches in diameter, at the back end where the bellows enter, and gradually diminishing to one inch, next the fire. At about the middle, the pipe is bent down at an angle of from twenty to forty degrees towards the fire. Instead of the usual collar next the fire, there is to be a metal plate ten inches long, and nine broad, "about one inch from the centre of which there is to be an angle of about ninety degrees, the broad part of this angled plate is to have a rise on the face of it at the centre, one inch high, and ten inches along the plate; the thickness of the said plate to be about three-fourths of an inch."

The foregoing description does not appear to us very clear, but it may be more fortunate with our readers.

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125. For *Blowing air into a millstone eye;* Austin Taylor, Littleton, Grafton county, New Hampshire, March 31.

"What the applicant claims as his invention, is the introducing a current of fresh air into the eye of a mill-stone, by any wind instrument or machine." Wind has already been blown into the eye of a mill-stone, to keep it cool, and has been made the subject of at least one patent.

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126. For *Spark Catchers, for locomotive steam engines;* William Schultz, county of Philadelphia, Pennsylvania, March 31.

There is to be a swell in the smoke pipe, which will give to it the form of two funnels joined together at their rims; and across this wide junction there is to be wire gauze stretched, the enlargement being intended to prevent any obstruction in the draught. The pipe for waste steam is to perforate the sheet of wire gauze, which is secured to it by a flanch. Flues, which may be opened when the engine is at rest, are to pass on the outside

of the conical enlargements, allowing a free draught; these are to be closed by valves, when the engine is in motion.

CLAIM. "What I claim is the whole arrangement, as hereinbefore described, without any connection with any other machine heretofore constructed for the same purposes."

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127. For a *Horse Power;* Richard Skinner, Williamson, Wayne county, New York, March 31.

A main wheel, turned by levers, or sweeps, is to run upon a hub, and axletree, instead of being fastened to a shaft. Nothing more.

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128. For a *Cooking Stove;* Benjamin H. Pearson, Warner, Merrimack county, New Hampshire, March 31.

This stove has an open fire place, in the form of a Franklin; to which is attached an oven, and other contrivances for cooking. The claim is to "heating the oven on five parts; its particular situation to give a draft under the oven, with an open fire-place; the damper; the turning a crank with two half oval wheels to raise or lower the grate in the fire-place."

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129. For a *Hydrant;* David Horn, city of Baltimore, March 31.

There is nothing in the principle, and but little in the arrangement, of this hydrant, different from others in common use. The pipe through which the water enters, under ground, has a socket in it that receives a vertical shaft, up which it is to flow to the point of delivery; the lower end of the shaft fits into, and turns in the socket, as a key in a cock, allowing the water to pass into it when in the proper direction, and when turned round a quarter of a circle, the water in the shaft runs into the ground through a waste hole in the socket.

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130. For a mode of *Joining Rail-road plates;* A. Mizick M'Cain, Montgomery, Montgomery county, Alabama, March 31.

A lap is to be formed at the junction of rail-road plates, by which each plate shall be in part over and in part under, its fellow; and so that a spike driven through shall confine both. The manner in which this may be done will be more readily conceived than described; to save circumlocution, therefore, we leave the mode of effecting it to be devised by the ingenuity of the reader, or to be learnt by application at the patent office.

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131. For an improvement in *Rail-roads;* Nathan Read, Belfast, Waldo county, Maine, March 31.

The oft-proposed device of a rack on the middle of the rail road, and of a toothed wheel on the axle of the locomotive, is the subject of this patent. The rack is to be made with rounds like a ladder, and the teeth in the wheel are to be larger than usual; these constitute the only change proposed in the mode described.

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132. For an *Ointment for Cancers;* Elias Gilman, Licking county, Ohio, March 31.

This ointment has the merit of being a tolerably safe application, which is much more than can be usually said of ointments for the cure of cancer. It consists of finely pulverised sulphate of iron made into an ointment with mutton suet. It is to be spread upon linen, and renewed when necessary.

The cancer is to be washed with a decoction of spikenard and tanners' ooze, and a decoction of yellow oak bark, and sometimes with a solution of potash and water.

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133. For a *Gripe Chuck, for turners;* David Peeler, Boston, Massachusetts, March 31.

This gripe chuck, it appears, is principally intended to hold, and to turn in the lathe, certain tools used by boot and shoe makers, known by the name of heel keys, fore part irons, and fore part beads. These, it is said, can be manufactured at a much cheaper rate, by means of the gripe chuck, than by the common mode. The claim is to the particular kind of chuck described.

Specification of an improvement in the Art of Tanning, granted to Henry C. Locher, Lancaster, Lancaster county, Pennsylvania, administrator of Henry Locher, deceased, March 12th, 1836.

To all to whom these presents shall come, be it known, that Henry Locher, late of the city of Baltimore, now deceased, in his life time, had invented a new and useful improvement in the art of tanning, called a Communicable Leach System in the art of Tanning, and that the following is a full and exact description thereof. A general communication with every vat intended to be used, is made by means of trunks, or tubes, placed on the outside, and about six inches from the top of the vat, and made level so that water may be sent with equal ease in any direction through them; a perpendicular trunk or tube, is placed in one corner of each vat, extending from the top, to within about four inches of the bottom; small tubes are branched off from the main, or horizontal trunk, or tube, and inserted into each of the perpendicular trunks, or tubes, and also into the opposite ends of the vats called handlers, and into the reservoir; other small tubes are made to connect the several perpendicular trunks, or tubes, with the adjoining vats, of those generally termed leaches, so that the liquor or juice of the bark may be transferred, or driven from one vat to another, in any direction. The perpendicular trunks, or tubes, may, to save room in the vats, be placed on the outside, with communication at the bottom.

This plan enables the tanner to multiply the liquors or juices, in the vats termed leaches, to any degree of strength, and at the same time to exchange strong for weak, without mixing scarcely any, and without labour more than drawing the plugs out of the tubes necessary to be opened, and turning the water from the hydrant, or pump, on one or more of the leaches, thus as many as you please will exchange, and the leaches successively recruit in strength. This is done on the philosophical principles of the lighter bodies rising to the top. As for example, to drive the strong liquor out of the vat, cause a light and steady stream of water to fall on the bark in the vat, or on a board laid on top of the liquor, and as soon as the liquor rises to the tube, in the perpendicular trunk, it escapes by that tube, and is let into any other vat that is opened to receive it, and its place is supplied by the water; if the reverse is wanted, let the liquor into the perpendicular trunk, it sinks to, and spreads over the bottom of the vat, and raises the water to the top, where it escapes by the small tube.

False bottoms are useful in this operation, as they prevent the trunks or tubes from being stopped, or clogged, and they receive the settlings.

What I claim as the invention of Henry Locher, deceased, and not previously known, is the trunks and tubes, and the manner of using them.

HENRY C. LOCHER.

Progress of Practical and Theoretical Mechanics and Chemistry.

Earthen retort for generating gas for the purpose of illumination. A patent for a composition for this purpose was secured to Thomas Spinney, of Cheltenham, gas engineer. The materials are—Stourbridge fire-clay, one hundred pounds; burnt Stourbridge fire-clay, twenty pounds; pipe clay, twenty pounds; sand, (which is recommended to be as free from lime as possible) twenty pounds.

The Stourbridge clay, both raw and burnt, are to be mixed together with the sand. The pipe, or potters' clay, must be well dried and broken into small pieces, and afterwards put into a copper, or furnace, containing as much boiling water as may be requisite to dissolve or reduce it to the consistence of thick cream, which is to be added to the other materials previously mixed; and as much more water is to be added as will make the whole mass of such a consistence as will admit of its being tempered in the manner generally practised by potters.

The materials thus combined, may be moulded into retorts of any required form; but the patentee says, I do not mean hereby to confine myself to any particular form or size of retort; they may be made in one or more pieces, as may be found most convenient. If made in one piece, after being dried, it must be brushed over with a glaze, or cement, composed of the following materials in the following proportions: of potters' lead ore, three pounds; sand, four pounds; sulphate of iron, one pound; pipe or potter's clay, one pound. These are to be reduced to fine powder, and mixed with as much water as will bring them to the consistence of paint, and then applied with a brush in the same manner as paint is used by painters. The retort must then be removed to the kiln, and what is technically termed smoked from twenty-four to thirty hours; and afterwards cooled or let down in the usual manner of cooling down earthenware. If the retort is made in more than one piece, the pieces should be formed to fit each other, and joined together with the above mentioned cement or glaze. The retort so formed is also to be brushed over with the said glaze or cement in the manner explained when the retort is made in one piece." Newton's Journal.

Patent invention for assisting the hearing. Mr. Webster was led to a consideration of this subject, by a sensible diminution of hearing in himself. He adverts to the common practice of applying the hollow of the hand to the back of the ear; to the fact that eastern nations, particularly the ancient Egyptians, (as is evident in antique remains) had the ear more fully developed, larger and more projecting; that this is still the case with savages, who are remarkable for the acuteness of their hearing; that the modes of covering the head have probably produced a permanent compression and diminution of the shell of the ear; and finally, that the Arabs, and occasionally individuals among ourselves, have voluntary power over the muscles of the ear.

The instrument he has invented he terms an OTAPHONE.

"They are formed from a correct model of the back of the ear, and by fitting all the irregularities of that very uneven and elastic surface, gently

press forward the parts so as to produce a more perfect orbit, and fuller recipient and sound; and being self supported, they occasion no inconvenience to the wearer. By thus concentrating all the powers that nature has provided, a considerable addition to the ordinary force of sound is obtained; dissipating dulness of hearing, when not arising from internal injury, and enabling those in whom this sense is perfect, to preserve the same advantage at a much greater distance. They will, therefore, be found particularly useful in places of public worship, courts of laws, the Houses of Parliament, theatres, and wherever the ordinary powers are insufficient; and by bringing the focus of sound into a more direct line with the face; the expression of the speaker is better preserved than by the unassisted ear.

It is, however, on the advantages they permanently confer, when their use is discontinued, or very rarely resorted to, that the inventor places his greatest reliance for their general adoption. Though obtuseness of hearing arises from many causes, one of the most frequent is the insufficient quantity of sound the external ear collects. When this is the case, the membrane of the tympanum, or drum of the ear, and the internal organs which depend on the vibration for their active employment, become relaxed, and contract the same degress of feebleness as would attach to any other part deprived of its natural action; and this inertness, or stagnation of their powers, renders them unable to surmount those occasional injuries that blows, colds, fevers, &c. create; and thus, from the most common accidents, a permanent injury to the sense is induced, which a more active state of the parts would frequently remove.

The otaphones are based upon the principle, of proportioning their assistance within the limits apparently assigned by nature. The alteration they occasion when worn, is but a restoration of the ear to its original and most useful shape; and for all their subsequent advantages, they depend on that peculiar fabric before described, and which is so happily adapted to the purpose, that no other substance can supply its place. They will, therefore, be found equal to the perfect restoration of the hearing, if any increase of sound, however trifling, is perceptible on their first application, and generally the use for an hour each morning, for a short time, is sufficient; but if the impediment has been of long continuance, and no advantage on trial is experienced, their employment, without previous preparation, will not be recommended. London Mec. Mag.

Manufacture of Beet-root Sugar in Russia. The manufacture of beet-root sugar in the Russian empire has of late become very extensive; there are already no less than twenty-five large establishments for this purpose in different parts. Thinking that the following account of one of the principal of these establishments, viz. Micharlofsky Sugar-works in the government of Tula, the property of Count Bobrinsky, may be interesting to the English public, I send it for insertion in your widely circulated Journal:

The quantity of beet worked in the year 1835 was 260,000 poods=to 85,357 cwt. 0 qr. 16 lbs.; the sugar produced from it, 15,600 poods=5014 cwt. 1 qr. 4 lbs.

Price of a pood of beet,	- - -	15 copecks.
Expense in working do.	- - -	35 do.
		50

Produce of one pood of beet $2\frac{3}{4}$ lbs. of raw sugar at 1 ro. 10 co. per lb.

The number of men employed 250.

The quantity of land required to produce the beet 350 deciatines—945 acres.

The beet is generally taken from the peasantry instead of the obrok or fine, they, as serfs, would have to pay their baron.

The proprietor of this manufactory is an accomplished and amiable nobleman; his experiment in this case has been highly successful.

One great evil is the impossibility hitherto experienced of keeping the roots any length of time, which makes it expedient they should be worked as soon as possible after they are taken from the ground.

I have been favoured with a specimen of raw and refined sugar from these works, of which I send you a small sample, and am only sorry the distance does not allow me to send a larger one.

The Russian lb. is equal to 14¼ oz. English; a pood 40 lbs. Russia=36 lbs. English; a rouble=100 copecks; sterling value 10½d.

Your constant reader, J. K.

Petersburg, June 25, 1836.

[The samples sent are excellent; the raw sugar not quite so good as that from the cane, but the refined equal to the best products of our refineries.—Ed. M. M.] Idem.

New mode of preparing Kerm's Mineral and the Golden Sulphur of Antimony. By M. Musculus. For the golden sulphur of antimony, I take—

Lime, slacked with a sufficient quantity of water,	6 parts.
Sub. carbonate of potash, or dry sub. carbonate of soda,	4
Finely pulverized sulphuret of antimony,	2
Flower of sulphur,	1
Sand, well washed and dried,	8

Mix them all well together, and put them in a funnel or other separating vessel, with a few small pebbles or coarse bits of glass underneath, and cover the mixture with a layer of sand. Pour on this by degrees, cold water, until the filtered liquid is no longer precipitated by hydrochloric acid.

The liquid thus obtained is to be sufficiently diluted with pure water and treated with hydrochloric acid. The precipitate, or golden sulphur of antimony, is to be carefully washed and dried in the common way. The product is about equal to the sulphuret of antimony employed.

To prepare Kerm's mineral proceed in the same manner, only leaving out the flower of sulphur. The liquid obtained is to be treated with a solution of bicarbonate of soda; or by passing through it a current of carbonic acid gas.

This method of preparing these two substances, by displacement, is new, and much more simple and economical, in time and expense, than the usual mode, and the products are as fine and abundant. The proportions may not perhaps be so rigorously exact as further experience may dictate. It is possible that a previous maceration may be useful.

Note by M. Boullay. We have repeated the process of M. Musculus, and find that the golden sulphuret of antimony, which it yields, is very beautiful—the kermes is heavy, and the colour not very good, but by substituting the dry carbonate of soda for potash, and adding to the filtered fluid an equal volume of pure water, deprived of air by heat, prior to the precipitation, we have obtained the kermes in great abundance, light, and of fine bright colour.

Thus the preparation of kermes, till now so embarrassing and capricious, will be extremely easy to practice, in small quantities as well as large, and the pharmaceuist will be no longer excusable in depending on commerce, now he can extract the kermes by simple lixiviation, in the cold, instead of long and reiterated ebullition. Jour. de Pharm.

Preservation of Cantharides. The rapidity with which mites attack cantharides, and the fact that they devour the soft parts of the flies, which are the most active, render any mode of effectual preservation very useful.

An experience of ten years enables me to affirm, that the process of Appert will thoroughly preserve them. The bottles containing the dried and sifted flies, being thoroughly corked, and fastened with double pack thread, are to be placed upright in a kettle of water, which is to be heated to ebullition and kept boiling, for half an hour, the bottle remaining until the water gets cold. They may then be put away in any cool place. If the insects are pulverized on being first taken from the drying stove, again left in the stove for a few hours previous to their being bottled, and afterwards treated as above, they will be still more effectually preserved. The eggs of the mites which adhere to the cantharides, though they may escape the heat of the stove, are destroyed by the boiling temperature, in well closed bottles. Idem.

Preparation of Extracts. The usual mode of obtaining vegetable extracts is by the aid of *heat*, but it is well known that the medicinal properties of compounds are often essentially altered by changes of temperature, and that the proximate principles of plants on which the virtue of extracts depends, may therefore be subverted at the high temperature at which they are sometimes obtained.

M. Guillard proposes to avoid the risk of such a deterioration, by pounding the fresh plant in a mortar, pressing out the juice in the cold, and evaporating it by a current of air from a smith's bellows. In this way he has perfectly succeeded in procuring the extract of *Aconitum Napellus*, after pounding, pressing and filtering, when the temperature of the laboratory did not exceed 10° to 13° cent.

A more perfect mode, perhaps, would be to evaporate by means of a vacuum, without heat, by which the agency of the atmospheric oxygen would be very much avoided, as well as that of increased temperature.

Idem.

Improvement in the Manufacture of Charcoal. It is well known that there is a very great loss of the carbonaceous portion of the wood in the usual careless way in which charcoal is made; and yet the greater density which the coal acquires by this process, than by that of close distillation, renders its quality very superior for the purpose of reducing ores. This is probably owing to the slower carbonisation which the wood undergoes, by which its molecules are dilated with less rapidity and force.

It has been ascertained by experiment, that when the interstices of the wood stacks for charcoal are filled with saw dust and the stack itself covered with it prior to the application of fire, the product of coal is from seven to nine per cent. greater than in the ordinary way. It requires rather more care in the beginning, to get the fire under way, and prevent its going out.

By covering, or mixing the charcoal with tar, before it is put into the

furnace with ore, so great a degree of activity is given to the fire, it may be worth the experiment to ascertain whether it would not be good economy to employ the tar of certain districts in this way.

Jour. Conn. Usuelles, Mai. 1836.

Preservation of Leeches. It has been found that a layer of charcoal in the bottom of the vessel of water in which leeches are kept, tends to their preservation. The writer left 25 leeches in a bottle for three months, expecting on his return to find them all dead, but, to his surprise, they were all alive. He afterwards obtained the best results by adopting this plan—changing the water once a week, a fortnight, or even a month, when inconvenient to do it oftener.

He also finds, that by placing the leeches, when full of blood, on ashes, in a dish, they will in a few minutes completely disgorge themselves, and when well washed in fresh water, will answer for subsequent operations. He has renewed this process more than twenty times, and has yet lost but four leeches.

After four or five days repose, they will perform their service as well as at first.

Idem.

Pork establishment of Mexico. There exists in Mexico a very fine race of hogs, which are regarded as an important article of commerce, and the care which is taken of these animals so far surpasses that which I have seen elsewhere, I think it may be very useful to our farmers, brewers, and distillers, to be made acquainted with the principal details.

The buildings of these establishments include a house for the manager and the workmen, a shop, a slaughter house, a place for singeing, rooms and vessels for the fat and lard, (articles which often supply, in Mexico, the place of butter) other rooms where black pudding is made and sold to the poor, and a soap manufactory, in which all the offals are used. The stables, which contain about 800 hogs, are behind these buildings. They consist of out-houses, well made, thirty feet deep, with overhanging roofs. The entrance is by a low vault, in front of which is an open space twenty-four feet wide, extending the whole length of the yard. In the centre of this is a stone aqueduct, through which flows clear water from a well or spring, the hogs being allowed to pass their snouts only into the stream, through openings in a wall, which prevents their soiling the beverage. It is the only liquid they are allowed to take. They are fed with Indian corn, slightly moistened, and spread upon the floor. The pens and the space on which the animals walk are kept in great cleanliness.

The hogs are in the immediate charge of a number of Indians, attached to the establishment, and who often give them a cold bath, for it is thought that cleanliness contributes to that prodigious increase of fat which constitutes their principal value. It is the business also of these care takers to keep them in good humour. Two persons are employed from morning to night in adjusting their quarrels, and in singing to induce them to sleep. These persons are chosen on account of the strength of their lungs and ability to charm the ears of their amiable associates, which is deemed an affair of no inconsiderable merit!

The proprietor of one of these establishments assured us that the expense of it amounted to 300,000 francs, and that the sales rose to 10,000 a week: the luxury of his equipage indicated, in fact, the possessor of a large fortune.

Idem—Juin, 1836.

Process for determining the existence of Sulphurous Acid in Common Hydro Chloric Acid. By M. GIRARDIN, *Professor at Rouen.* Put into a glass about half an ounce of the hydrochloric acid to be tried, and add to it 120 to 180 grains of the proto-chloride of tin, (common muriate of tin) very white and not altered by the air, stir it with a rod, and add to it two or three times as much distilled water, and agitate the mixture. If no sulphurous acid be present, nothing appears; the salt dissolves, and the fluid only becomes a little disturbed by the action of the air on the salt; but if the smallest portion of sulphurous acid be present, a cloud is immediately perceived, the acid becomes yellow, and when the distilled water is added, the odour of sulphuretted hydrogen is manifest, a brown appearance ensues, and a powder is deposited. These phenomena are so obvious, that there need not be a moment's hesitation with respect to the sulphurous acid.

Sometimes the brown colour does not appear till after some minutes have elapsed. The more sulphur, the deeper it is. The sulphuretted hydrogen is evident only when the water is added. The yellowish brown powder which subsides is a mixture of sulphuret and peroxide of tin.

This process will detect a hundredth part of sulphurous acid in the hydro chloric. The method is now practised in the workshops of Rouen.

Annales de Chim. Mars. 1836.

A new process of Carbonisation, by the aid of the waste flame at the tops of high furnaces. By M. VIRLET, *mining engineer.* This process has been practised more than a year by Fauveau-Deliars, forge master at Bièvres, near Grandpré (Ardennes) as well as at several high furnaces in the neighbourhood, with complete success. It seems to have resolved the problem, for a long time a matter of research,—to discover the means of economizing and turning to account, the great quantities of fuel which are entirely lost in the forests, by the common method of coal burning. It consists in allowing the heat of the coal kilns to go no farther than is necessary to drive off the water and the oxidatiny gases. It appears to me to be destined to produce a revolution in forges. A patent for fifteen years has been granted for this improvement, to Houzeau-Muiron, and Fauveau-Deliars.

The following statement is taken from the books of the High Furnace of Montblainville, of results before and after the adoption of the new process:—

Seven cords of wood, of fifty to fifty-two cubic feet, gave, by the old process, four kilolitres (thirty-five cubic feet) of charcoal, producing 800 kilogrammes of cast-iron,—about one ton. To this must be added the market toll, which, in that district, is one-sixth, which brings the actual consumption of charcoal to four and two-third kilolitres for 800 kilogrammes of iron.

Three and a half cords, of the same dimensions, give, by the new method, the same quantity of charcoal, or four kilolitres, producing the same quantity of iron, but less mixed, better, more tenacious, softer, and attended with less loss in blooming, whether by charcoal or pit coal.

There is no toll on the charcoal in the new process, for it is thrown into the furnace as soon as made, and while still warm. It is also proved that the furnace works more rapidly with the new charcoal, increasing the fabrication one-third; so that there is to be added to the advantage before

mentioned, a diminution in the general expenses of production, and a diminution of one-half in the quantity of wood consumed.*

Annales des Mines, 1836.

M. De Milly's *Star Candle Manufactory, Paris.* The French appear to have effected a great improvement in candles, by separating the crystallizable portion of tallow, the stearine, from its other constituents, and rejecting the latter in the composition of their bougies. But stearine itself is a compound of stearic acid and glycerine, and it is the former only which is wanted in the preparation of the most perfect bougies.

To accomplish this more perfect depuration, the stearine is converted into soap, with lime, and this soap is then decomposed by dilute sulphuric acid, forming an insoluble precipitate of sulphate of lime, and leaving the crystallizable stearic acid free.

The saponification of the stearine with lime, is aided by a high temperature, (140° cent.=284 Far.) which produces a corresponding pressure on the liquid, and by suitable agitation. The stearic acid, when separated, is thoroughly washed by hot water and steam, and then set aside to crystallize in tinned vessels.

The cakes thus obtained are broken up, put into sacks, and subjected to the gradual action of a hydraulic press. The greater part of the oleic acid is thus forced out, with a variable portion of the solid acid which it carries with it, depending on the temperature.

The material thus obtained is still more completely purged by a cold pressure in other hydraulic presses, not less powerful, but arranged horizontally. This leaves the solid matter of a splendid pearly white, exempt from odour, but not yet sufficiently purified. It is melted again in water, sharpened with sulphuric acid, washed, and cast into moulds, when it becomes a crystalline mass, and is fit for the preparation of stearine candles.

The strong tendency to crystallization presented a formidable difficulty in the moulding of the candles. In the earlier manufactory of the improved candles this difficulty was overcome only by adding twenty-five to thirty-three per cent of wax, to the purified stearic acid. This added greatly to the cost.

* In a circular which accompanies our French journals, issued by the above patentees, it is stated, that agreeable to the best analysis, wood contains thirty-five to thirty-seven per-cent. of carbon, and that by the common mode of burning charcoal in the forests, only sixteen to seventeen per cent. is obtained. The annual consumption in France of wood, and in the reduction of iron ore, is from thirty to thirty-one millions of francs, more than one half of which, of course, is pure loss, by the common mode of carbonization. By employing the waste heat of the furnace, they are able, with a simple and not costly appendage to convert the wood into a compact charcoal, which possesses great calorific power, and represents almost the whole of the carbon contained in the wood, and preserves in addition, a portion of the hydrogen. The relative expense of the two modes is thus represented.

Old Process.	Fr.	*New Process.*	Fr.
7 cords of wood produces 40 kilolitres of coal,	42 00	3½ cords of wood, giving also 40 kilolitres of coal,	21 00
Expense of coal burning in the forest,	3 00	Transport of wood at 2½ fr. per cord,	7 00
Transport to the furnace of 40 kilolitres,	4 00	Sawing and carbonization at the furnace.	3 50
One-sixth for toll,	8 16		31 50
	57 16		

Difference in favour of the new process, 25 fr. 66c. G.

An attempt was made at improvement by adding about a thousandth part of arsenious acid, in powder, to the stearic acid. This pretty effectually cut the crystals, (as the workmen termed it) but the process was objectionable, diffusing a disagreeable odour in apartments where many of the lights were burning.

M. de Milly now employs a more simple process, exempt from all reproach, and which requires only five hundredth parts of wax. It consists in disturbing the crystallization by a rapid transition from the liquid to the solid state, effected by dipping the moulds momentarily in water, of about the temperature of congelation of the purified material, and then pouring in the melted substance at a temperature but little higher than the melting point. This ingenious management secures to this fine improvement all the success that could be hoped for. The manufacture has become greatly extended; the wholesale price has been lowered from 2 fr. 25 c. to 1 fr. 75 c, and the retail price from 2 fr. 50 c. to 2 francs the metrical pound, while at the same time the quality of the article is much improved. A steam generator is used in De Milly's factory, for heating and in most of the mechanical operations, and about eighty people, men, women and children are employed in it. Bull. d'Encour. Mars. 1836.

Improved Perpetual Oven. The silver medal was granted to *Jametel & Lemare*, for an oven, the fuel of which is placed under ground, and in large mass. The doors of the furnace and ash pit being closed, no air gains access, except what filters as it were through the masonry. By this means the combustion continues a long time. The oven being long and continuous, the air which enters it is at first much heated, but being gradually cooled by the evaporation from the bread, it descends by its gravity, and again enters the oven to renew the process, thus maintaining a continued current, which regulates the temperature. Idem.

The Prompt Copyist. An ink of a particular consistency is fabricated by *M. Lanet*,—and from a page written with it, two impressions may be taken on varnished or waxed cloth. The powder of a hygrometic ink is then spread on the cloth, and adheres only to the characters impressed. The surface of the cloth is easily moistened, the dampness attaching itself only to the powder, leaving the rest of the cloth free. Two impressions are then taken from each of the proofs, making, with the original letter, five copies, all perfectly legible. The silver medal was granted to M. Lanet. Idem.

Improved Tanning. M. Renou has devised a method of tanning rabbit skins, so as to render them at thick as cow skin. With these he tans boot legs and the upper leather of shoes, so as to be without a seam, leaving the hair inside. Leggings, buskins, caps, &c. are also manufactured of this new material. Rabbit skins which before were worth but 10 centimes, now sell from 1 fr. 50 c. to 4 francs. Cat skins may be treated in the same manner. This invention obtained the platina medal. Ibid.

Pink Colour employed in English Porcelain. By M. Brongniart. The beautiful English porcelain, known by the name of *Iron Stone*, is figured with a pink or purplish colour, very agreeable to the eye, the preparation of which has been kept a secret. M. Malaguti, attached to the Royal Manufactory at Sèvres, having analyzed this colour, finds it to be composed of

stannic acid 100 parts, chalk 34, oxide of chrome 1, silex 5. Combining these materials by a strong calcination, he obtained a colour at least as fine as that of the English. The trials that have been made of it at the factory of *L. Lebeuf*, at Montereau, on the fine ware called *opaque porcelain*, have perfectly succeeded. Bull. d'Encour. Mai. 1836.

New method of feeding calves. M. Labbé, member of the council of administration of the Agricultural Society, finding that the carrot is one of the most nutritious kinds of food for cows, greatly increasing the quantity of milk, and furnishing a richer cream, he reduced half a pound of carrots to a pulp, boiled it four or five minutes in half a pint of water, and added the whole, in two portions, to the noon and evening mess of a calf, five days old. The same food, as a substitute for milk, was increased daily, so that on the eleventh day the boiled carrots were given as the entire food, except that after the eighth day a boiled potatoe was added to each of the three daily messes. The calf not only thrived finely, but grew so fat, that on the twentieth day, not intending it for the butcher, they were obliged to moderate the food. Idem.

Physical Science.

BRITISH ASSOCIATION.

Large lens of rock Salt. Sir David Brewster having been authorized to expend £80 in the construction of a lens of rock salt, stated that through the kindness and activity of Dr. Traill, he had procured from Cheshire several splendidly transparent and homogeneous crystals of rock salt; and that he had little doubt that these would in every way answer the desired end; but that, as a lens, when constructed of this material, would require to be adapted to a certain glass lens or lenses—and as the construction of each of these and their mutual adaptation was a matter requiring not only the nicest mechanical manipulation, but also a skill and knowledge of principles which was not to be expected in workmen of an ordinary class—he had most reluctantly been compelled to abstain from an attempt at the actual construction, but he hoped very soon to have it in his power to accomplish this most desirable object. Athenæum.

Tide observations at Liverpool and London. M. Lubbock being called upon to give an account of the recent discussion of tide observations, for which a liberal grant of money had been made by the Association, rose and stated, that through the indefatigable exertions of Mr. Dessiou, considerable progress had been made in the reduction of the observations made at Liverpool by Mr. Hutchinson.

The diurnal inequality of difference between the superior and inferior tide of the same day, which in the Thames was very inconsiderable, if not insensible, was found at Liverpool to amount to more than a foot; a matter upon which the learned gentleman laid considerable stress, as calculated to lead to important practical results. The object of these reductions was to compare the results of theory with these observations, and with those of Mr. Jones and Mr. Russell, made at the port of London. The principal objects of comparison were the heights of the several tides, and the intervals between tide and tide; and these were examined in their relations to the parallax and declination of the Moon and of the Sun, and in reference to local, and what may in one sense be called accidental causes, as storms, &c.

Of this latter, one of the most curious, as well as important, is the effect of the pressure of the atmospheric column. The learned gentleman stated, that M. Daussy had ascertained, that at the harbour of Brest a variation of the height of high water was found to take place, which was inversely as the rise or fall of the barometer, and that a fall of the barometer of 0.622 parts of an inch, was found to cause an increase of the height of the tide, equal to 8.78 inches in that port. To confirm this interesting and hitherto unsuspected cause of variation, had been one principal object of the researches of the learned gentleman, and at his request, Mr. Dessiou had calculated the heights and times of high water at Liverpool for the year 1784, and compared them with the heights of the barometer, as recorded by Mr. Hutchinson for the same year; and by a most careful induction, it had turned out that the height of the tide had been on an average increased by one inch for each tenth of an inch that the barometer fell, *cæteris paribus;* but the time was found not to be much, if at all, affected. Mr. Lubbock then proceeded to examine the semi-menstrual declination and parallax correction, and stated that the result was a remarkable conformity between the results of Bernouilli's theory, and the results of observations continued for nineteen years at the London Docks. But to render the accordance as exact as it was found to be capable of being, it was necessary to compare the time of the tide, not with that transit of the Moon which immediately preceded it, but with that which took place about five lunar half days. To explain this popularly, the learned gentleman stated, that however paradoxical it might appear to persons not acquainted with the subject, yet true it was, that although the tide depended essentially upon the Moon, yet, any particular tide, as it reaches London, would not be in any way sensibly affected, were the Moon at that instant, or even at its last transit, to have been annihilated; for it was the Moon as it existed fifty or sixty hours before, which caused the disturbance of the ocean, which ultimately resulted in that tide reaching the port of London. The learned gentleman then exhibited several diagrams, in which the variations of the heights of the tide, as resulting from calculations founded upon the theory, were compared with the results of observations. The general forms of the two curves which represented these two results, corresponded very remarkably; but the curve corresponding to the actual observations, appeared the more angular or broken in its form, for which the learned gentleman satisfactorily accounted, by stating that the observations were neither sufficiently numerous, nor sufficiently precise, from the very manner in which they were taken and recorded, to warrant an expectation of a closer conformity, or a more regular curvature. When it is recollected that the observations are at first written on a slate, and then transferred to the written register, by men otherwise much employed, and whose rank in life was not such as would lead us to expect scrupulous care, it was not to be wondered at, if occasionally an error of transcript should occur, or even if the observation of one transit was set down as belonging to the next. When to these circumstances it was added, that the tide at London was in all probability, if not certainly, made up of two tides, one having already come round the British Islands, meeting the other as it came up the British Channel, it was altogether surprising that the coincidence should be so exact; and it was one among many other valuable results of these investigations, that it was now pretty certain that tide tables constructed for the port of London, by the theory of Bernouilli, would give the height and interval with a precision quite sufficient for all practical purposes, and which might be relied on as sufficiently exact,

when due caution was used in their construction, and the necessary and known corrections applied. In conclusion, Mr. Lubbock said, the Observations for the port of London had now been continued from the commencement of this century, and those for Liverpool, as we understood, about twenty-five years.

Prof. Whewell observed, that as, in the discussion of the relative level of land and sea, the tides of the ocean were an important element, he should preface the remarks upon that subject, which he intended to submit, by making a few observations upon the very valuable communication of his friend Mr. Lubbock. This communication he highly eulogized, and pointed out to the Section the importance of many of the conclusions, should they prove hereafter to be generally applicable: but he expressed strongly his fears that this would not be the case. Observation had, in the instance of the tides, far outstripped theory, for many reasons, which it would be impossible to detail; but among the most prominent were the complexity of the problem itself involving the astronomical theories both of the Sun and Moon; the masses of these bodies; the motions of disturbed fluids, and local causes tending to alter or modify the general geographical effect of the great tide-wave at any particular place. It was upon a careful review of these considerations, that he was led to fear that it would be still many years before theory would become so guarded and supported by local observations; as to afford a sufficiently correct guide to be implicitly relied on in these speculations. He instanced the tides of the British Channel, which, in consequence of their excessive magnitude, afforded magnified representations of the phenomena, by which the deviations become more remarkable. At the port of Bristol, the tide rose to a height of fifty feet, while towards the lower part of the Channel they only rose twenty, and along other parts of the coast not quite so high. The most striking of Mr. Lubbock's conclusions was that by which it appeared that the ocean assumed the form of the spheroid of equilibrium, according to the theory of Bernouilli, but at five transits of the Moon preceding the tide itself. By the calculations of Mr. Bent, however, it would appear, that although the observed laws of the tides at Bristol might be made to agree with Bernouilli's theory of equilibrium tides, by referring them to a certain anterior transit,—so far as the changes due to parallax were concerned, as also as far as those due to declination were concerned,—yet it turned out that this anterior period itself was not the same for parallax as for declination. The two series of changes have not therefore a common origin or a common epoch; so that in fact there is no anterior period which would give theoretical tides agreeing with observed tides; and, therefore, at least the Bristol tides do not at present appear to confirm the result obtained by Mr. Lubbock from the London tides. The learned gentleman then illustrated these views by diagrams, by the aid of which he explained to the Section the luni-tidal intervals, and the curve of semi-menstrual inequality—(this latter term, and the doctrine connected with it, was introduced into the subject of the tides by the learned gentleman himself, and, as is admitted by all acquainted with the subject, with the most valuable result.)

Relative Level of Land and Sea. Prof. Whewell then proceeded to give an account of the proceedings of the committee appointed to fix the relative level of land and sea, with a view to ascertain its permanence, or the contrary. He observed, that the Committee had not taken any active, practical steps for the important purposes for which they were appointed, be-

cause they had met with many unexpected difficulties requiring much consideration. It was, however, intended to appoint a Committee for the same purposes, who should be furnished with instructions founded upon the views at which the former committee had by their labours and experience arrived. One method proposed was, that marks should be made along various parts of the coast, which marks should be referred to the level of the sea; but here the inquiry met us in the very outset—what is the proper and precise notion to be attached to the phrase the *level of the sea?* Was it high water-mark, or low water-mark? Was it at the level of the mean tide, which recent researches seemed to establish? In hydrographical subjects the level of the sea was taken from low water, and this, although in many respects inconvenient, could not yet be dispensed with, for many reasons, one of which he might glance at—that by its adoption, shoals which were dry at low water, were capable of being represented upon the maps as well as the land The second method proposed appeared to the learned Professor to be the one from which the most important and conclusive results were to be expected. It consisted in accurately leveling, by land survey, lines in various directions, and by permanently fixing, in various places, numerous marks of similar levels at the time; by the aid of these marks, at future periods, it could be ascertained whether or not the levels, in particular places, had or had not changed, and thus the question would be settled whether or not the land in particular localities was rising or falling. Still further, by running on those lines, which would have some resemblance to the isothermal lines of Humboldt, as far as the sea coast, and marking their extremities along the coast, a solution would at length be obtained to that most important practical question,—what is the proper or permanent level of the sea at a given place? Until something like this were accomplished, the learned Professor expressed his strong conviction of the hopelessness of expecting any thing like accuracy in many important and even practical cases. As an example, he supposed the question to be the altitude of Dunbury Hill referred to the level of the sea. If that level of the sea were taken at Bristol, where the tide rises, as before stated, fifty feet, the level of low water would differ from the same level on the sea coast at Devonshire, where the sea rises, say eighteen feet; and supposing, as is most probable, the place of mean tide to be the true permanent level by no less a quantity than sixteen feet, which would therefore make that hill to appear sixteen feet higher, upon a hydrographical map constructed by a person taking his level from the coast of Devonshire, than it would appear upon the map of an engineer taking his level at Bristol. In the method proposed, the lines of equal level would run, suppose from Bristol to Ilfracomb in one direction, and from Bristol to Lyme Regis in the other, and by these a common standard of level would soon be obtained for the entire coast.

Professor Sir William Hamilton rose to express the sincere pleasure he felt at the masterly expositions of Mr. Lubbock and Professor Whewell. One conclusion to which Mr. Lubbock had arrived was to him peculiarly interesting, viz. that by which it appeared that the influence of the Moon upon the tides was not manifested in its effects until some time after it had been exerted, for a similar observation had recently been made by Professor Hansteen respecting the mutual disturbances of the planets.—Mr. Lubbock rose to say, that the agreement between the results calculated from the theory of Bernouilli and those obtained from actual observation, were much more exact than Professor Whewell seemed to imagine; in truth, so close was the

agreement, that they might be said absolutely to agree, since the difference was less than the errors that might be expected to occur in making and recording the observations themselves.—Mr. Whewell explained that he wished to confine his observations to the Bristol tides, as these were the observations to which he had particularly turned his attention; and, with respect to which, he should be able, at the present meeting, to exhibit diagrams to the section, which he felt confident would amply bear out his assertions respecting these tides.—Mr. Lubbock stated, that so near, indeed so exact, had been the coincidence between the observations made at London and Liverpool, and the theory, that he was strongly inclined to believe that that coincidence would be found at length to be universal.—Professor Stevelly inquired from Mr. Lubbock, whether he did not think it quite possible that local causes might exist, which would be fully capable of producing the deviations from the theory of Bernouilli; as, for instance, in the case of Bristol, so ably insisted upon by Professor Whewell, where the causes of the extraordinary elevation are the land-locking of the tide-wave, as it ascends the narrowing channel, and the reflexions of other tide-waves from several places. Now, particularly in the case of reflex tides, may it not so happen, and does it not, in fact, happen in several places, that they bring the actual tide to a given port at a time very different from that at which the influence of the Moon and Sun, if unimpeded, would cause it to arrive, and thus separate, as Professor Whewell had stated, the origin or epoch of the variations due, suppose to parallax and declension, and even cause other deviations from Bernouilli's theory?—Mr. Lubbock replied, that unquestionably it might so happen; but, in his opinion, the discussion of a few observations, like those made at Bristol, could not be expected to point out very exactly the origin or epoch of either of the variations of parallax or declination, with sufficient exactness, to furnish secure data for determining that they did not correspond to any one, common, previous transit of the Moon.

Jerrard's Mathematical Researches. Prof. Sir William Hamilton read his report on Mr. George B. Jerrard's mathematical researches, connected with the general solution of algebraic equations. He wished, in the first place, to inform the Section, that no part of the grant of 80*l.* had been expended, which the Association had so liberally placed at his disposal for the purpose of procuring the assistance of persons competent to verify, by numercial computations, the method of Mr. Jerrard. The reason that he had not deemed it necessary to resort to this expense was, that he had, at a very early period after the meeting of the British Association in Dublin, satisfied his own mind that the method of Mr. Jerrard entirely failed in accomplishing the solution of equations of the fifth and sixth degree; and he trusted that he should be able to lay before the Section, with as much clearness as the abstruse nature of the subject would admit of, the principal steps of a demonstration, which, to the mind of the learned Professor himself, at least, carried a complete conviction, that the method of Mr. Jerrard was not applicable until the equation, as a minor limit, had reached the seventh degree. In order that he might carry the Section fully along with him, Professor Hamilton stated, that it would be necessary to give again a rather detailed account of the peculiarities of the very ingenious notation, devised by Mr. Jerrard, for denoting certain algebraic processes, resorted to in the application of his method. The Professor then proceeded to detail to the Section the several steps of Mr. Jerrard's method, clearly marking the steps

previously known to analysts, and such as Mr. Jerrard had the merit of originating. The principal peculiarity of *formulæ* seemed to be, that in an equation, transferred in a particular manner for the purpose of eliminating the co-efficients of the original equation, the co-efficients were so ingeniously obtained as to be entirely independent of the degree of the original equation, and therefore to be of a similar form in all possible equations, the solutions of which were sought. As soon as he had prepared these formulæ, the Professor proceeded to demonstrate to the Section, that from the very nature of their connexion with the original equation, they must fail in giving its solution, where it only rose to the fourth dimension, because he showed that this would involve the solution of an equation of the sixth degree, as a preliminary step. Equations, however, of this degree had been long solved, and it was only, therefore, in connexion with the generality of Mr. Jerrard's method, that its failure, as regarded them, was of any consequence. He then proceeded to give a similar demonstration of its failure, as regarded equations of the fifth and of the sixth degree; and during his discussion of this step of his demonstration he took occasion to show that Mr. Jerrard's method had succeeded in reducing equations of the fifth degree to tables of double entry—a discovery, upon the value of which he enlarged considerably, and highly eulogized and complimented the author; insomuch, that he stated that if the method had accomplished nothing but this alone, Mr. Jerrard would have received the congratulations of the scientific world. He then proceeded to show, that unless the index of the equation reached as a minor limit the number seven at least, a certain intermediate equation, concerned in the elimination, would be met with, along with a multiple of it, which, therefore, would not give a number of distinct results sufficient to complete the eliminations; but, beyond that degree, he stated that he had satisfied himself that Mr. Jerrard's method would afford solutions of equations, which, even if they should, from their complexity, or other causes, be useless to the practical or merely arithmetical algebraist, yet to those engaged in prosecuting inquiries involving purely symbolic algebra, he felt confident they would afford facilities and general methods of investigation, hitherto almost undreamed for and unexpected.

Mr. Babbage complimented Sir W. Hamilton upon the very lucid exposition which he had given of a subject which he characterized as bordering upon the very extremest limits of human knowledge, and congratulated Mr. Jerrard upon the success with which he had contrived so effectually to distinguish between the symbols of operation and those of quantity, in expressing the results of elimination. Engaged, as it was well known he was, in a branch of practical numerical science, he could not suffer himself to be supposed to look with indifference upon a discovery which, if it should even fail in affording any practically important assistance to his particular branch, must yet be admitted to afford the strongest promise of advantage to the more purely abstract branch of algebraic investigation.—Professor Peacock observed, that during the progress of the discussion of this question he had not failed to remark the many advantages which must result to algebra from Mr. Jerrard's method, from the collateral improvements to which the prosecution of his principal object had led, partly in suggesting new, and hitherto unexplored, methods of elimination, and partly by leading to a notation, which so clearly distinguished between the marks of quantity and the observations and changes which were to be resorted to in reference to them; but as to the result itself, he need characterize it no higher, when he added, that it was an advance in the science, which it did not appear that the cele-

brated La Grange had ever contemplated, and which was not approached by the result of Stchernhausen.

Experiments with a view to determine the Interior Temperature of the Earth. Prof. Phillips stated that this subject had for a long period engaged the anxious attention of scientific men, both at home and upon the continent; that the most accurate, as well as numerous, experiments indicated a decided elevation of temperature as a more depressed station below the earth's surface was attained; even when the depths descended to were small, this elevation of temperature became large enough to arrest attention; in fact, the temperature of the air, of the water, of the rocks, and of the soil, was found to augment as we descended. But in order to ascertain, if possible, what portion of this heat arose from, or was connected with, an elevated temperature of the internal parts of the globe, as well as to ascertain whether the causes of these were local or universal, and, if possible, to arrive at the law of its distribution, it was deemed a matter of much importance to get rid altogether of the effect of the air's temperature upon the thermometer, as also the action of water, because the sources of the water in mines, &c. must be in most cases entirely beyond the reach of observation. All these circumstances induced the committee appointed by the Association to conduct experiments upon this subject, to take the temperatures of the rocks themselves alone, as the fundamental experiments. With this view, they had no less than thirty-six thermometers made and carefully compared, and, although they well knew that these thermometers, after all the care which had been bestowed upon their construction, were by no means perfect or exact, yet, as their errors had been carefully noted, by a comparison with the standard thermometers of the Royal Societies of London and Edinburgh, and each thermometer numbered, the errors admitted of an easy correction. Many of these thermometers had been already placed under the care of persons adequately instructed to conduct the requisite experiments, and some of them were still in the possession of the committee, who would gladly place them in the charge of any person giving adequate security that they should be applied to the purpose for which they had been procured. The method of using them was this: a hole large enough to receive one of the thermometers, was first drilled into the solid rock, at the bottom of the mine, pit, or other proper place of observation, to the depth of two or three feet at least; into this the thermometer was then introduced and suffered there to remain for a number of days sufficient to ensure the attainment of the temperature of the rock itself. The temperature of the air at the mouth of the pit, and, if possible, the mean temperature of the place, must be observed or obtained. Professor Phillips then stated, that observations had been made in this manner, and with some of these instruments, under the directions of Professor Forbes, at mines in the Lead Hills, in Scotland, and that Professor Forbes would take some early opportunity of bringing these observations more immediately under the notice of the Section; at Newcastle, under the direction of Mr. Briddle; at Wearmouth, under the care of Mr. Anderson; near Manchester, and at Northampton, under the direction of Mr. Hodgkinson; and within a few days, Professor Phillips had been enabled, through the kindness of a friend, to place a thermometer in a deep coal mine at Bedminster, in this immediate vicinity (Bristol.) The results of these observations, so far as they had as yet proceeded, amply confirmed the fact of the increase of temperature in the parts under the earth's surface. As one example, the Professor

stated, that in a mine, the perpendicular depth of which, below the surface, was 525 yards, the thermometer in the rock stood at 78°, while the temperature in the open air at the mouth of the mine, varied from 30° to 80°, the mean temperature of the place being 47½°.

Prof. Forbes then gave, from memory, an account of the experiments which he had been the means of instituting in the Lead Hills. Before he did so, however, he wished to state that he had been informed that an artesian well had lately been met with in granite, and he then gave a general description of artesian wells. It was to this effect: that heretofore, in making borings in certain districts through certain alternations of clays, and at length through certain rocks, a supply of water was reached, which rapidly rose through the boring to the surface, and continued to overflow at the top sometimes, as the term fountain indicated, in considerable quantity, and with considerable force. He instanced the artesian wells, or fountains, of the London clay districts; and added, that the temperature of these waters was found universally to increase with the depth of their source beneath the surface of the earth. Heretofore, no such well had been obtained by boring through the granite; and if the account, which he had received, were correct, and of its correctness he entertained little doubt, this would be a matter of considerable interest as well to the geologist as to those who were engaged in scientific pursuits similar to those now under consideration. The observations made under his direction in the Lead Hills, alluded to by Professor Phillips, were almost entirely conducted by Mr. Irvine. These observations were particularly interesting, from the fact, that the mines, in consequence of a strike among the workmen, had not been worked for many months, and at the same time it most fortunately happened that they were self drained, that is, by machinery worked by external power, without the aid of either animals or steam. This most fortunate concurrence of favourable circumstances, which could be expected to be met with in so very few instances, at once disembarassed the observations from many sources of error, which, but for this, would have still left considerable doubts of the results being, partially, at least, affected by the heat generated by animals residing and working in the mines, as well as of artificial fires kept up for the purposes of ventilation or of originating power. It was upon these grounds that he perceived the importance of them, but had it not been for the valuable assistance afforded him by Mr. Irvine, who descended into the mine, and placed the thermometer and made the observations, he could scarcely have been as successful as the results already obtained warranted him in hoping he should be. These results, which, of course, had not as yet reached the degree of accuracy which he still looked for, lead to the conclusion that the temperature in that mine increased about 50 of Fahrenheit for a descent of ninety-five fathoms.—Professor Stevelly stated, that as practical utility was one of the principal objects of the British Association, he might be permitted to add, that the waters of these wells, in consequence of their temperature being in general elevated above the mean temperature of the place at which they delivered their waters, had been applied to the very important practical purpose of freeing machinery of ice in winter, insomuch, that by their instrumentality, machinery, such as water wheels, &c., which had always previously been clogged by ice for a considerable part of the winter, to the great loss of the owner's manufactory, were, by the aid of the waters of these fountains, kept constantly free; while the same water has been, in some instances, conducted through the factory itself, with a view to keep up a uniform and elevated temperature

within its walls, thus affording a second and a very valuable practical application.

London Athenæum, No. 461.

Progress of Civil Engineering.

Health of Cities—Improvement of London.

Our last number contained the substance of a Report on the plan of a celebrated artist, J. Martin, for the improvement of the British Metropolis, preceded by some general remarks on the importance of a due consideration of the plans upon which our own cities are regulated, in reference to salubrity and comfort. We now insert the strictures which have been made upon Martin's scheme of improvement, by a writer in the London Architectural Magazine.

"That we have thought on the different subjects treated of in this *Report*, will appear evident from two articles; the one, *A Plan for saving the Manure lost in the common Sewers of London, and rendering the Thames Water fit for domestic Purposes;* and the other, *On Breathing Places for the Metropolis, and other Towns*, which appeared in the *Gard. Mag.*, vol. v., for 1829. It will be seen, even from the titles of these articles, that we approve of the general principle of preventing the London sewers from emptying themselves into the Thames; and of saving every particle of the manure which they contain. We differ, however, from Mr. Martin, in preferring several intercepting sewers to one, which one, from its unavoidable magnitude, we think would be liable to very great risks in times of heavy rain, or severe frost, notwithstanding the precaution of flood-gates; which, even if found efficacious, would, in a great measure, defeat the purpose of the sewer, by contaminating the water of the Thames.

Another difficulty regarding Mr. Martin's plan, is the quantity of sewer water that will require to be either evaporated, or run off, from the manure reservoirs. This quantity would necessarily be immense, and may be estimated by the quantity brought into London by the different water companies, or obtained from wells, &c., in addition to what falls from the clouds. If this water is neither evaporated nor run off, then the contents of the sewers must be conveyed in their present state to the grounds where they are to be employed as manure; but to convey all the water contained in the sewers of London in "covered barges, or properly constructed land-carriages," may be safely pronounced impracticable. We have no doubt of the utter impossibility of evaporating this water during the winter months, and, consequently during that season at least, it must be run off. Mr. Martin has not stated how he means to dispose of it. It is certain that, if it found its way into the Thames any where above Gravesend, it would, from the influx of the tides, contaminate the water as far as London and, if it remained in ponds in the neighbourhood of the reservoirs of manure, it would cover great part of the surface of the Essex marshes. The superfluous water, we think, would be best got rid of by running it off from the manure reservoirs into an open sewer, parallel to the Thames, and continued as far as the sea, and then allowing it to escape among the sea water, which is already unfit for human use. The salt seas, then, in every part of the world, appear to be the only natural cess-pools, or reservoirs, for the sewers of great cities; and, unquestionably, the only true principle of arranging the sewerage of all cities, towns, and even villages, which are built

along the banks of rivers, is by forming sewers parallel to those rivers, and not so far from them as to occasion any difficulty in the sewers receiving the drainage of the space between them and the margin of the river.

If the building of London were to be recommenced, the first step should be to form two sewers parallel to the Thames, though at such a distance from it as to admit of forming docks, basins, &c., on its banks; but, as this has not been done, the question is (now that the ground is covered with houses and streets, and various docks, basins, and canals,) how to remedy the evil? We are inclined to think it will be better done by two or three intercepting sewers, at different distances from the Thames, than by one so close to that river, and so large, as that which Mr. Martin proposes. One sewer might be carried at about the distance of the Strand, more or less, as might be convenient; a second, about the distance of Holborn, which should intercept all the sewers between it and a third, about the distance of the New Road, which should, in like manner, intercept all the sewers northwards. The directions of these sewers must necessarily vary with the inclination of the surface, so as to keep the bottom of each sewer of one uniform declivity; and they might all unite in an open sewer, or ditch, a few miles down the river, which ditch might be continued to the sea, or to the point where the water of the Thames became decidedly salt. Where the sewer met with rivers or canals, it might cross beneath them in inverted siphons, such as those employed in conveying the water used in irrigation in Lombardy. Indeed, a considerable part of the water of this sewer, and, possibly, at some seasons of the year, the whole of it might be employed in irrigation; in which case it should be raised from the sewer by machinery, impelled by steam, and conveyed to the fields intended to be irrigated by open ditches, or in pipes. By the latter mode, it might be conveyed many miles in the interior, even over a hilly country: and, perhaps, such a mode of irrigation would even now pay the British cultivator.

If intercepting sewers of the kind described were to be carried into effect in London, they might all be so deep under ground as to be excavated by tunneling, and, consequently, the surface, and the buildings on it, would be scarcely at all disturbed. The expense, also, of this mode of excavating sewers, we think, might be more readily ascertained than that of forming one immense tunnel in Mr. Martin's manner; as it could not vary much from that of the present ordinary sewers. One obvious advantage of this mode of forming intercepting sewers is, that, by dividing the water to be conveyed away into different portions, there never could be any danger from the stoppage of a sewer, at all to be compared to that which would result from the bursting of one main sewer, which should contain the contents of all the sewers of the metropolis on one side of the river. Anothe advantage is, that, by having the intercepting sewers considerably deeper than the ordinary ones, there would be no occasion to stop up the ends of the ordinary sewers which crossed them; in consequence of which, if any intercepting sewer were at any time choked up, the superfluous water would readily find its way through the ordinary sewer, into the next intercepting sewer, or, at all events, into that which was on a lower level. Again, a system of intercepting sewers would not interfere with any of the docks, ro with the canals which join the river, which the scheme of a single sewer adjoining the Thames, we think, would certainly do.

If such a system of sewerage were formed on the intercepting principle, or, indeed, on any other, to be effective in preserving the purity of the water of the Thames, it must be commenced above Brentford, or rather,

perhaps, at Oxford, and continued, at least, for some miles below Gravesend. Wherever the sewer did not pass through towns or villages, it might be an open ditch; and it would form, during its whole length, a valuable source of liquid manure to the adjoining lands. Of course, it could easily be carried under rivers, streams, or canals, connected with the Thames, by the mode already suggested; and such proprietors as chose might have a covered ditch instead of an open one. Other proprietors might have iron pipes, even though they lived at several miles distance, communicating with the sewer; and, by applying pumps to these pipes, they might obtain water for the purposes of irrigation at pleasure.

We shall, perhaps, surprise our readers when we state, as our candid opinion, that we do not think the "magnificent promenade on each side of the river, to be formed by the conversion of the roofs of the colonnaded wharfs into parapeted walks," would be at all desirable. A quay, or broad terrace walk, along the banks of the river, we think, would be highly so; but to stop up the ends of the streets by this colonnade, and its parapeted roof, would, we think, prevent their proper ventilation; and we are sure that it would totally destroy the beautiful views of the river, now obtained by looking down them; which views, in a large city, more particularly in summer, are peculiarly refreshing to the sight, from the idea of coolness conveyed by the vast expanse of water, as contrasted with the dust and heat of the streets. Were such a colonnade and public walk executed, there can be no doubt it would produce a very grand impression at first sight; but by no means so much so as might be imagined. This, a little reflection will convince any philosophic architect, must necessarily arise, from the circumstance of its ground plan having neither regularity nor symmetry; that is, of its consisting neither of one or more straight lines, nor of one or more regularly curved lines, nor of such a combination of these as would suffice to form a symmetrical whole. In the absence of both regularity and symmetry, the monotony of the impression of grandeur would, we think, soon become wearisome. In proof of this, we may refer to the elevations of the houses in the streets on the banks of the Spree, at Berlin; to those on the banks of the Neva, at St. Petersburgh; and even to those on the banks of the Arno, in some parts of Florence and Pisa. If, instead of the proposed colonnaded quay, we had only an architectural basis, such as would be formed by a river wall, like those in the cities mentioned, and a broad promenade within it, we should, in the elevations of the houses facing the river, greatly prefer the variety that would be produced by the mixture of public and private buildings, by the different purposes for which both were erected, and by the wealth, taste, and even no taste, of the erectors, to any regular design whatever. In short, we are of opinion that Mr. Martin's colonnade, grand and sublime as we allow it to be, if executed on either, or on both sides of the Thames, would take away half the interest and variety which at present attaches to that river.

By adopting the principle of having sewers parallel to all rivers and streams throughout the whole of their course, every particle of manure, and more especially of liquid manure, would be saved. In thinly inhabited countries, sewers of this kind are out of the question; but in such as are densely peopled they seem to be absolutely necessary for the preservation of the purity of the water of the rivers. There must, we think, be something radically bad in the geographical police of a country, in which not only the water of all the rivers is more or less polluted, but in which an

immense quantity of the most valuable description of manure is habitually and irrecoverably lost.

If a system of intercepting sewers were adopted, extending from Brentford or Windsor to Gravesend, there could be no difficulty in supplying London with pure water from the Thames. If, on the other hand, the system of making all the rivers of a country serve as its main sewers, as is at present the case, not only in Britain, but throughout the world, is to be persevered in, it may be reasonably pronounced impossible ever to obtain perfectly pure water in large quantities, in densely peopled countries; since every part of the rivers of such countries must contain more or less of those fæcal impurities, which, according to Dr. Granville, neither subsidence nor fermentation will remove.

With this view of the subject, we do not approve of Mr. Martin's plan of forming a dam across the Thames, and supplying the metropolis from the water above it, for though we admit that this water is much more pure than that of the Thames opposite London, yet still it would contain all the impurities of Brentford, and the tributary sewers from the intervening villages. Mr. Telford's plan is not without objections of the same kind: in short, there is no plan by which immense quantities of perfectly pure water can be obtained in a densely peopled country like England, but by preserving the purity of the rivers by intercepting sewers, or by raising the water from inferior strata, in which there may prove to be an abundant supply. When we consider the advantage that would arise from saving and applying to the surface of the soil the immense quantity of liquid manure now utterly lost, and, at the same time, the desirableness of having pure water in all large cities, we cannot help thinking that the subject of intercepting sewers deserves the attention of government, and of the proprietors of lands in the country, no less than of the dwellers in towns.

Mr. Martin's plan for a parapeted public walk by the side of the river is magnificent; but, as we have already stated our objections to the proposed structure, it is unnecessary here to add anything more respecting it. An uncovered parapeted quay, like that which borders both sides of the Neva, at St. Petersburg, we should wish to see carried along both banks of the river; and this, besides facilitating business in business hours, would form an excellent promenade in the evenings, and on Sundays.

In the year 1829, in consequence of an attempt made in parliament to procure a bill for enclosing Hampstead Heath, our attention was directed to the subject of public walks and breathing places; and the following is an extract from an article which appeared in the Gardener's Magazine for that year:—

"A late attempt in parliament to enclose Hampstead Heath has called our attention to the rapid extension of buildings on every side of London, and to the duty, as we think, of government to devise some plan by which the metropolis may be enlarged so as to cover any space whatever with perfect safety to the inhabitants in respect to the supply of provisions, water, and fresh air, and to the removal of filth of every description, the maintenance of general cleanliness, and the despatch of business. Our plan is very simple; that of surrounding London, as it already exists, with a zone of open country, at the distance of say one mile, or one mile and a half, from what may be considered the centre, say from St. Paul's. (*fig.* 143.) This zone of country may be half a mile broad, and may contain, as the figure shows, part of Hyde Park, the Regent's Park, Islington, Bethnal Green, the Commercial Docks, Camberwell, Lambeth, and Pimlico; and it may be suc-

ceeded by a zone of town one mile broad, containing Kensington, Bayswater, Paddington, Kentish Town, Clapton, Lime House, Deptford, Clapham, and Chelsea: and thus the metropolis might be extended in alternate mile zones of buildings, with half mile zones of country or gardens, till

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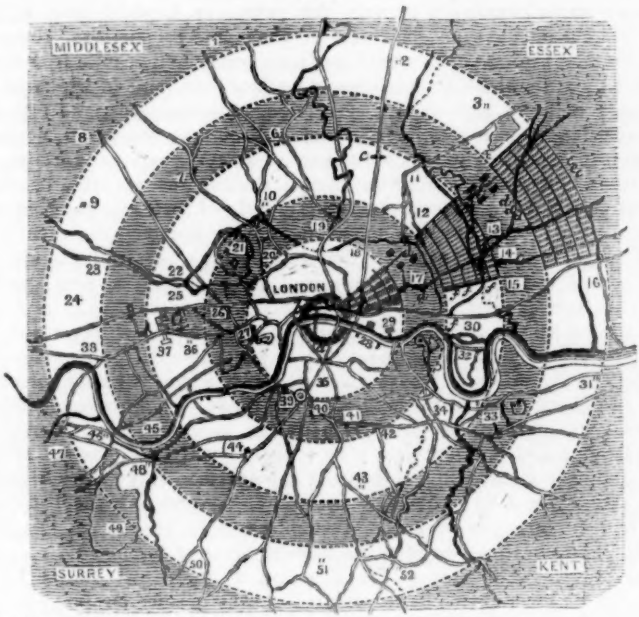

1. Finchley common; in the zone of country.
2. Tottenham; in the zone of town.
3. Walthamstow; town.
4. Forrest House; town.
5. Stoke Newington; town.
6. Highgate; country.
7. Hampstead; country.
8. Kingsbury; country.
9. Wildsdon; town.
10. Kentish Town; town.
11. Clapton; town.
12. Hommerton; town.
13. Stratford; country.
14. West Ham; country.
15. West Ham Abbey; country.
16. East Ham; town.
17. Bethnal Green; country.
18. Hoxton; town.
19. Islington; country.
20. Somers' Town; country.
21. Regent's Park; country.
22. Paddington; town.
23. Paddington canal; town.
24. Six Elms; town.
25. Bayswater; town.
26. Hyde Park; country.
27. Green Park; country.
28. Southwark; town.
29. London Docks; town.
30. West India Docks; town.
31. Woolwich; town.
32. Isle of Dogs; town.
33. Greenwich Park; country.
34. Deptford; town.
35. Walworth; town.
36. Brompton; town.
37. Kensington; town.
38. Hammersmith; town.
39. Lambeth; country.
40. Kennington; country.
41. Camberwell; country.
42. Peckham, town.
43. Dulwich; town.
44. Clapham; town.
45. Fulham, country.
46. Putney; town.
47. Rochampton; country.
48. Wandsworth; town.
46. Wimbledon Park; country.
50. Tooting; town.
51. Norwood; town.
52. Sydenham; town.

one of the zones touched the sea. To render the plan complete, it would be necessary to have a circle of turf and gravel in the centre of the city, around St. Paul's, half a mile in diameter. In this circle ought to be situated all the government offices, and central depots connected with the administration of the affairs of the metropolis. That being accomplished, whatever might eventually become the extent of London, or of any large town laid out on the same plan and in the same proportions, there could never be an inhabitant who would be farther than half a mile from an open airy situation, in which he was free to walk or ride, and in which he could find every mode of amusement, recreation, entertainment, and instruction.

"Supposing such a plan considered desirable, it could not, perhaps, be carried into execution in less time than 50 or 100 years, on accouut of the large sums that would be required for purchasing the valuable houses that must be pulled down to form the central circle of turf, and the first zone of country. But, were government to determine the boundaries of certain future zones, and to enact a law that no buildings now standing on the future zones of country should be repaired after a certain year; and that, when such houses were no longer habitable, the owners should be indemnified for them by the transfer of other houses of equal yearly value in another part of the metropolis, belonging to government; the transition (considering the alteration in the value of property which is likely soon to take place, in consequence of the numerous rail-roads, &c., now going forward,) would not be felt as the slightest injustice or inconvenience. Government would be justified in adopting a plan of this sort, from its obvious reference to the public welfare; and a committee appointed to carry the law into execution should begin by purchasing such lands as were to be sold in the outskirts of the metropolis, in order to be able, at a future period, to exchange them for lands destined to form the central circle of the first zone. In endeavouring to give an idea of the situation of the zones round London, (*fig.* 143.) we have drawn the boundary lines as perfect circles; but, in the execution of the project, this is by no means necessary, nor even desirable. The surface of the ground, the direction of streets already existing, which it would not be worth while to alter, the accidental situations of public buildings, squares, and private gardens, with other circumstances, would indicate an irregular line, which line would at the same time be much more beautiful as well as economical."

In judging of the remarks in this and the preceding page, it must be recollected that they were written in 1829.

Mechanics' Register.

Rail Road Iron. The iron that will be required for rails, chairs, and carriages, and other works for the roads for which bills were obtained during the last session of Parliament, will amount to at least 220,000 tons, and for bills previously obtained, 70,000 tons, making a total of 290,000 tons, which will probably be in requisition for the next four years. With respect to the United States rail roads, we find by the *American Rail Road Journal*, that the extent either actually under contract, or in progress of being surveyed, amounts to more than 3000 miles. To lay a double line this distance will take 750,000 tons of iron. Lon. Min. Jour.

British Hardware. It appears from Parliamentary returns, that the

quantities of foreign iron imported into the United Kingdom in 1835, amounted to upwards of 21,150 tons, while the amount of British bar iron exported was 94,383 tons, and of other kinds of iron an amount which made the grand total 194,590 tons. A document from the custom house, entitled a "Return of British hardware and cutlery exported from the United Kingdom in the year 1835," makes the total amount 20,197 tons, the value of which was £1,833,042. Of this amount 11,062 tons, value £978,491 was sent to the United States. The whole amount for 1835 was an increase of 23 per cent. on that of the preceding year. Since 1820 the exports of hardware and cutlery have doubled in value. The exports of every description of hardware, with iron and steel, wrought and unwrought, amounted in value to £3,789,206, in 1830; and last year to £6,154,625.

Ibid.

Light Lace Veils. Mr. Babbage gives the following account of the lace made by the *phalæna pandilla*, a caterpillar. The invention is by a gentleman of Munich. He makes a paste of the leaves of the plant which is the usual food of the species of caterpillar he employs, and spreads it thinly over a stone or other flat substance; then, with a camel-hair pencil dipped in olive oil, he draws upon the coating of paste the pattern he wishes the insects to leave open. The stone being placed in an inclined position, a species of caterpillar which spins a strong web is laid at the bottom, and the insects commencing from that point, cut and spin their way up to the top, carefully avoiding any part touched by the oil, but devouring all the rest of the plant. These veils have not a great deal of strength, but they are surprisingly light. One of them, measuring twenty-six inches and a half by seventeen inches, weighed only 1.51 grain; a degree of lightness which will appear more strongly by contrast with other fabrics. One square yard of the substance of which these veils are made weighs $4\frac{3}{4}$ grains, whilst one square yard of silk gauze weighs 157 grains, and one square yard of the finest patent net weighs $622\frac{1}{2}$ grains. Ibid.

Embossing on Wood. The following method of embossing on wood, invented by Mr. Straker, is extracted from the *Transactions of the Society of Arts*; it may be used either by itself or in aid of carving, and depends on the fact, that, if a depression be made by a blunt instrument on the surface of wood, such depressed part will again rise to its original level by subsequent immersion in water. The wood to be ornamented having first been worked out to its proper shape, is in a state to receive the drawing of the pattern; this being put in, a blunt steel tool, or burnisher, or die, is to be applied successively to all those parts of the pattern intended to be in relief, and at the same time is to be driven very cautiously without breaking the grains of the wood, till the depth of the depression is equal to the subsequent prominence of the figures. The ground is then to be reduced by planing or filing to the level of the depressed part, after which the piece of wood being placed in water, either hot or cold, the parts previously depressed will rise to their former height, and will thus form an embossed pattern, which may be finished by the usual operation of carving. Ibid.

Liverpool and Manchester Rail-way. The company opened their new tunnel, at the entrance of the rail-way at Liverpool, to the public, on Monday last. The tunnel is a mile and one-third in length, it is twenty-one feet high, and the span of the arch is twenty-five feet. The tunnel from one end to the other is cut out of the solid rock, which, in some places, rises as high as the spring of the arch. The crown of the arch is composed of very

strong brick work. The cost of this laborious undertaking amounted to 150,000*l.* It will be attended with great convenience to the public, as the former station was about two miles from Liverpool. It occupies about six minutes for a full train to pass through the tunnel. Ibid.

An International Rail-way Company has been provisionally formed for connecting London with Brussels and Paris by rail roads, via. Dover and Calais, with various branches. This measure appears to receive the sanction of all the governments concerned. The capital is estimated at £4,500,000, to be raised in England, France and Belgium. The greater part of the surveys have been already made. Abstract—Ibid.

Floating Wood. The prodigious quantity of wood brought by the sea to Iceland is thought by M. Eugene Robert to come from two continents at least. Trees are thrown ashore there, sometimes without roots, and without bark, the latter being frequently found by the side, folded like a roll of parchment. M. Robert has not been able to procure any floating fruits, but he has ascertained that mahogany is often landed in Iceland in the above manner. Ibid.

Tea-pots made by steam. Britannia metal tea-pots are now made by steam; the round bodies are spun, and the wooden handles and knobs are cut up by powerful steam engines. A good workman can spin twenty dozen of pot-bodies in a day. Ibid.

List of American Patents which issued in July, August, September and October, 1836.

The subjoined list of patents commences with those issued under the new patent law; we have heretofore numbered them from the first of January, to the end of the year, and shall hereafter pursue the same course, but on the present occasion we commence a new series with the new system.

Applications for patents now undergo a strict examination in the office, before they are granted; and upwards of three-fourths of those examined have, under the provision of the existing law, been deemed imperfect, and returned for amendment, or rejected for want of novelty. This, together with the delay incident in establishing a system of procedure altogether novel, accounts for the smallness of the number granted since its adoption.

July.

1. *Locomotive engines.*—John Ruggles, Thomastown, Maine. 13
2. *Wool, &c. manufacturing.*—John Goulding, Boston, Mass. 29

August.

3. *Turning sheaves, &c.*—Thomas Blanchard, city of New York. 1
4. *Rounding the edges, &c. of a block.*—Thomas Blanchard, city of New York. 10
5. *Boring and mortising the shells for do.*—Thomas Blanchard, city of N. York. 10
6. *Plank blocks, forming.*—Thomas Blanchard, city of New York. 10
7. *Boring holes and scoring dead-eyes.*—Thomas Blanchard, city of New York. 10
8. *Cutting scores round blocks, &c.*—Thomas Blanchard, city of New York. 10
9. *Riveting plank blocks.*—Thomas Blanchard, city of New York. 10
10. *Dye woods, cutting.*—Beriah Swift, Washington, N. Y. 10
11. *Double speeder for roving.*—Aza Arnold, N. Providence, R. I. 10
12. *Veneers, laying.*—John Soule, New Bedford, Mass. 31
13. *Polishing wire for reeds.*—Arnold Watkinson, Providence, R. I. 31

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14. *Cotton planter.*—Henry Blair, Glenn Ross, Maryland. 31
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16. *Cutting sheaves, &c.*—Thomas Blanchard, city of New York. 31
17. *Countersinking for bushes.*—Thomas Blanchard, city of New York. 31
18. *Forming cheeks of plank.*—Thomas Blanchard, city of New York. 31
19. *Springs for saddles.*—William Duchman, Morgantown, Penn. 31

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20. *Granite dressing machine.*—William Morse, Corrina, Maine. 8
21. *Expansion and contraction of metals, applying.*—Hazard Knowles, Hartford, Conn. 8
22. *Furnace for buildings.*—Frederick A. Friekardt, Easton, Penn. 8
23. *Mortising machine.*—David Clark, Brooklyn, Conn. 14
24. *Sawing shingles.*—Jonathan Hobbs, jr. Falmouth, Maine. 14
25. *Silver spoons, making.*—Josephus Brockway, Troy, N. Y. 20
26. *Paints, composition of.*—Harman Hibbard, Darien, N. Y. 20
27. *Cylinders.*—Henry P. Howe, Shirley, Mass. 20
28. *Lamp for spirits.*—Isaiah Jennings, city of New York. 22
29. *Power loom, take up motion.*—Horace Hendricks, Killingly, Conn. 22
30. *Light, production of.*—Isaiah Jennings, city of New York. 22
31. *Ever pointed pencil case.*—Jacob J. Lownds, Philadelphia. 22
32. *Stove.*—John Harriman, Haverill, Mass. 29
33. *Steam boiler.*—Jos. W. & Elias Strange, Taunton, Mass. 29
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37. *Boot crimper.*—Ebenezer G. Pomeroy, Newark, Ohio, 1
38. *Purifying water.*—Moody Park, Madison, Indiana. 4
39. *Double hydrostatic oil press.*—Orestes Badger & Orrin Lull, Waterloo, N. York. 5
40. *Hand printing press.*—Frederick J. Austin, city of New York. 8
41. *Lamps.*—Alonzo Platt, Middletown, Conn. 8
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44. *Shelling corn.*—Joseph C. Baldwin, Staunton, Virginia. 11
45. *Window fastenings.*—N. Hall & Jotham Chase, Maine, 11
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54. *Horse power.*—Orestes Badger, Cooperstown, N. Y. 15
55. *Door plates.*—Ithiel S. Richardson, Boston, Mass. 15
56. *Combing hemp, flax, &c.*—Samuel Couillard, Boston, Mass. 19
57. *Horse power.*—Daniel Fitzgerald, New York. 19
58. *Razor case and sharpener.*—E. M. Pomeroy, Wallingford, Conn. 19
59. *Putting up rope yarns.*—James H. Echols, Lynchburg, Virginia. 20
60. *Weavers' harness, making.*—John Blackman, Brooklyn, Conn. 20
61. *Cooking stove.*—John Whiting, city of Boston. 20
62. *Power loom take up motion.*—John P. Comsin, Killingly, Conn. 20
63. *Weavers' Harness.*—John Blackman, Brooklyn, Conn. 20
64. *Knob for doors.*—E. Robinson, F. Draper and J. H. Lord, Mass. 20
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LUNAR OCCULTATIONS FOR JANUARY, 1837.

Calculated by S. C. Walker.

Day.	H'r.	Min.			N.	V.
19	15	16	Im.	47 Geminorum, 6,	147	207
19	15	36	Em.		181	240
20	12	57	Im.	α^1 Cancri ,6,	110	151
20	14	4	Em.		210	265
20	13	37	Im.	α^2 Cancri ,6,7,	57	108
20	14	57	Em.		263	321
23	8	34	Im.	42 Leonis ,6,	83°	32
23	9	41	Em.		263°	185
29	16	6	Im.	2 Libræ ,5,6,	43	15
29	17	18	Em.		250	237

Meteorological Observations for September, 1836.

Mean. Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
			Inches	Inches			Inches.	
1	69	69	29.80	29.85	SW	Moderate.		Clear—cloudy.
2	54	82	29.90	30.10	NE.W.	do.		Clear do.
3	60	70	30.00	30.00	W.	Brisk.		Cloudy—flying clouds.
4	63	74	29.90	30.00	SW.	Brisk.		Cloudy—flying clouds.
5	68	78	29.91	29.90	SW.	do.		Lightly cloudy—do.
6	50	64	30.00	30.00	SW.	Moderate.		Cloudy—thunder—rain.
7	52	64	30.10	30.05	E		.24	Clear do.
8	54	69	30.05	30.15	NE.	Moderate.		Cloudy—flying clouds.
9	60	77	30.10	30.05	E.W.	do.		Drizzle—clear
10	62	63	30.05	30.00	NE.E.	Brisk.	.4	Cloudy—cloudy.
11	61	70	30.00	30.00	NW.W.	Calm.		Cloudy, do
12	62	76	30.00	30.00	W.	do.		Fog—flying clouds.
13	65	82	30.05	30.10	W.	Moderate.		Fog—clear.
14	70	80	30.15	30.15	S.	do.		Foggy—flying clouds.
15	71	77	30.15	30.15	NE.	do.		Fog—lightly cloudy.
16	68	73	30.15	30.15	E.	do.		Cloudy do.
17	66	78	30.04	30.00	SE.W.	do.		Cloudy—lightly cloudy.
18	68	83	29.90	29.90	SW.	do.		Fog—Clear
19	72	86	29.90	29.90	SW.	do.		Fog do
20	74	86	29.90	29.90	W.	do.		Clear do
21	66	71	30.05	30.06	NE.E.	do.	.9	Rain do
22	65	70	30.00	30.00	ESE.	do.		Cloudy—rain.
23	70	74	29.90	29.95	W.	do.	.3	Heavy Fog—Clear
24	69	78	29.90	29.90	SE.	do.		Fog—flying clouds.
25	60	64	29.90	29.90	NW.	do.		Clear,
26	46	62	30.10	30.00	W.	Brisk.		Clear, do
27	52	62	29.90	29.95	SW.	do.	.20	Rain—flying clouds.
28	55	61	29.80	29.85	SW.	do.	.60	Clear—lightly cloudy.—rain in nt.
29	47	49	29.75	29.75	SW.	do.		Cloudy do
30	56	60	30.04	30.04	NE.W	do.		Clear do.
Mean	60 73/30	71.53	29.95	29.95			1.95	

Thermometer. Barometer.

Maximum height during the month 86, on 20th. 30.15 on 7th, 14th, 15th, 16th.

Minimum do. 36. on 30th. 29.50 on 25th.

Mean do. 66.14. 29.93.

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